PROMOTING SUN PROTECTIVE BEHAVIORS THROUGH A SCHOOL-PLUS-HOME INTERVENTION

By

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Logan Wright, in an article published in the American Psychologist in 1967, stated that one of the founding tenets of pediatric psychology included prevention. Prevention is logical because it takes action to avoid development of a problem or may identify problems early enough to minimize their potential negative outcomes. With this in mind, primary prevention of skin cancer in children is becoming a major priority in pediatric psychology. Parents are the primary means by which the risk of skin cancer can be reduced and schools are being targeted as the primary vehicle to initiate health promotion in this area. In the present study, an intervention including parents (School-Plus-Home) was compared to a School intervention with demonstrated effectiveness and a no-intervention Control group. Data were collected in eight randomly assigned elementary schools in three North Central Florida counties. It was hypothesized that the children in the School-Plus-Home intervention would exhibit greater knowledge, more positive attitudes and beliefs, greater intention to engage in sun protective behaviors, and

would report engaging in more sun protective behaviors than children in either the School group or no-intervention Control group. Furthermore, a conceptual model for predicting sun protection intentions and behaviors was examined. Findings suggest that the School-Plus-Home intervention was effective at increasing knowledge, intentions, and sunscreen use among children. However, it was not significantly more effective than the School group. Results of evaluation of the conceptual model indicate that the best predictor of future behavior is past behavior. This study is intended to add to the literature regarding school-based interventions for sun protection. It is considered to be a significant contribution given the fact that no other intervention in this area has included a family component. The findings are discussed in terms of the need for awareness and dissemination of information concerning sun exposure, its relationship to skin cancer, and possible preventive behaviors. The implementation of effective interventions in schools and with families is emphasized.

INTRODUCTION

Health Promotion/Disease Prevention

The increasing costs of medical care, together with the recent developments in managed care, call for the initiation of disease prevention and health promotion programs that defray costs and enhance the general well-being of the population. Health promotion is defined by the World Health Organization (WHO) as a process of enabling people to increase control over and to improve their health (WHO, 1986). In the late 1970s and early 1980s, the need for health promotion and disease prevention programs was recognized. Priorities for health promotion set forth in the 1978 report, Federal Programs and Prospects, included the areas of smoking, alcohol and drug abuse, nutrition, exercise and fitness, and management of stress (cited in Iverson & Kolbe, 1983). At that time, it was obvious that the area of sun protection was not of major concern. However, in a report by the Surgeon General, Healthy People 2000 (USDHHS, 1990), an objective was written to "increase to at least 60 percent the proportion of people of all ages who limit sun exposure, use sunscreens and protective clothing when exposed to sunlight, and avoid artificial sources of ultraviolet light (e.g., sun lamps, tanning booths)" (pp.425-426).

One of the founding tenets of pediatric psychology included prevention (Wright, 1967). Prevention is logical because it takes action to avoid development of a problem or may identify problems early enough to minimize their potential negative outcomes (Roberts & Peterson, 1984). With this in mind, primary prevention of skin cancer in

children is becoming a major priority in pediatric psychology. Kalnins, McQueen, Backett, Curtice, and Currie (1992) discussed the benefits of thinking of children as active participants in their own health promotion rather than as recipients. They further indicated that research has suggested that an important component of health promotion for children should be lifeskills training that provides children with an understanding of and opportunities to practice the skills they require to resolve health problems. The schools can play an important role in implementing these programs.

Skin Cancer: The Problem

Skin cancer is a growing problem in this country and around the world, and there is growing recognition that behavioral scientists can play an important role in this area by delineating correlates of preventive behaviors and designing interventions to reduce high risk behaviors. Exposure to the sun causes vasodilation and an increase in the volume of blood in the dermis which is perceived as visible reddening of the skin, or sunburn (Council on Scientific Affairs, 1989). In particular, Ultraviolet-B (UV-B) radiation is most efficient in causing sunburn. Frequent and prolonged exposure to ultraviolet rays will induce cellular changes in the skin. Cancer is caused by the abnormal growth of cells. Skin cancer results from the abnormal growth of cells of the epidermis, although, as in the case of malignant melanoma, the cancer may metastasize or spread to other parts of the body.

Basal cell cancer accounts for 75% of all skin cancers. This cancer, which commonly occurs on the face and ears, develops in the layer of cells that forms the base of the epidermis. Squamous cell cancer accounts for 20% of all skin cancers. This also arises from the epidermis and most commonly appears on the face, ear, neck, lip, and

hand. Melanoma, which occurs in only 5% of skin cancer cases but accounts for 75% of the deaths, is the least common but most dangerous and deadly of the skin cancers (ACS, 1988).

Basal cell cancers appear as small, round or oval patches, shiny and firm, usually white or gray, but sometimes pink or red. Squamous cell cancers can differ more in the way they look, but are usually small, round, slightly raised, and red and crusty. Melanomas often occur where there is a mole. There may be asymmetry, border irregularity, differential color, or the diameter of the mole is large and/or growing larger. Thus, skin cancer can be diagnosed by examining the skin and any moles that may be present (ACS, 1988).

According to the American Cancer Society (1988), there are four main ways of treating skin cancer: excisional surgery, electrodessication (destroying the cancer cells with heat), cryosurgery (freezing the cancer cells until they die), and radiation therapy. Chemotherapy has not been found to be very effective in treating widespread melanoma. Nearly 99% of all basal and squamous cell cancers that are detected early and treated promptly are cured. The overall 5-year survival rate for basal and squamous cell cancers is about 95% while the 5-year survival rate for malignant melanoma is 81%.

Concerns over the depletion of the ozone layer have brought forth the realization that skin cancer has and will become more prevalent (Amron & Moy, 1991). According to the most recent report from the American Cancer Society (1998), about 1 million Americans will be diagnosed with skin cancer in 1998. The incidence rate of melanoma increased about 4% per year from 5.7 per 100,00 people in 1973 to 12.2 per 100,000 in 1993 and the lifetime risk for malignant melanoma is projected to be 1 in 75 for the year

2000. Over 41,600 new cases of melanoma were expected to be diagnosed in 1998. Based on national trends (ACS, 1998), about 9,200 people are expected to die from skin cancer in 1998, 7,300 from melanoma and 1,900 from other skin cancers. This is a decline from the 1997 projections of 9,500 total deaths, with 7,300 from melanoma and 2,200 from other skin cancers (ACS, 1997). Furthermore, the estimated yearly costs of treatment for skin cancer exceed $160 million (ACS, 1998).

Children and Skin Cancer

The behavior of children places them at considerable risk for developing skin cancer in adulthood. Children are likely to have greater exposure to mid-day UV rays than adults, particularly during play periods or recess at school and during the summer months (Truhan, 1991). Stern, Weinstein, and Baker (1986) reported that the average child receives 3 times the annual UV-B dose of sun rays of the average adult. Furthermore, it has been estimated that 80% of a person's lifetime sun exposure occurs before the age of 21 and the risk of developing a malignant melanoma is doubled if a person has had one or more severe sunburns in childhood (Banks, Silverman, Schwartz, & Tunnessen, 1992). In light of these data, it has been recommended that sun protection efforts be initiated from birth (Truhan, 1991) and be incorporated into school curricula (Hughes, Altman, & Newton, 1993; Mermelstein & Riesenberg, 1992; Ramstack, White, Hazelkorn, & Meyskens, 1986).

There has been limited empirical research into the behavioral aspects of skin cancer prevention. Yet, the research that has been conducted has proposed that there are many preventive measures that can be taken with regard to skin cancer. The regular use of sunscreen during the first 18 years of life would reduce the lifetime incidence of

tumors by 78% (Stern et al., 1986). However, this is a current topic of debate, with some researchers (Berwick, 1996) indicating that promoting sunscreen use is not warranted and, in fact, is associated with development of melanoma and others asserting that the potential benefits of sunscreen use far outweigh the potential adverse consequences (Gilchrest, 1993). The American Cancer Society (1990) also suggests that along with applying sunscreen, wearing protective clothing and refraining from sun exposure during mid-day, will also limit the risk of developing skin cancer.

Stern et al. (1986) are explicit in providing the risks and benefits of using sunscreens in attempting to explain why people may choose to or choose not to use sunscreen. The benefits are reducing the chance of developing painful sunburns, retarding the pace of skin aging, and reducing melanoma risk. The risks of using sunscreen may be: inconvenience of application, staining of clothes, occasional irritation, and possible allergic reactions to the sunblocking agent. The benefits of engaging in the other preventive behaviors are similar, with little risks.

The literature in this area is explicit in attempting to determine the correlates of skin cancer knowledge and sun protective behaviors. Several correlates have been examined including history of sun exposure and sunburns, age, skin type, perception of a tan being healthy, familial history of skin cancer, and SES. Most studies that are conducted on this topic focus on the use of sunscreen.

Several researchers found that greater sunbathing frequency and less sunscreen use in children and adolescents were strongly associated with having less knowledge about skin cancer (Banks et al., 1992; Keesling & Friedman, 1987; Mermelstein & Reisenberg, 1992; Robinson, Rademaker, Sylvester, & Cook, 1997). In fact, only 15%

of 9-10 year-olds in one study (Oakley, Bendelow, Barnes, Buchanan, & Husain, 1995) knew that avoiding sunburn was an effective way to prevent cancer. Keesling and Friedman (1987) surveyed 120 beach-goers in California and found that skin cancer knowledge was a significant predictor of sunscreen use. Mermelstein and Riesenberg (1992) used a nine-item questionnaire to assess high school students' skin cancer knowledge and found that higher levels of knowledge were associated with an increase in taking precautions toward skin cancer and greater frequency of sunscreen use. However, Cockburn, Hennrikus, Scott, and Sanson-Fisher (1989) found that although adolescents have a high level of knowledge, they engage in few skin-protective behaviors. Robinson et al. (1997) telephoned 658 teenagers between the ages of 11 and 19 who lived in the Midwest and found that although the teens knew that too much sun was harmful and caused sunburn and skin cancer, they did not engage in protective behaviors.

Johnson and Lookingbill (1984) conducted a study in which 489 patients were surveyed to assess habits and beliefs concerning skin cancer and sunscreen use. They found that although 71% of the subjects reported one or more hours of sun exposure at least one day per week, only 41% used sunscreens. MacKie, Aitchison, and Freudenberger (1989), in a case-control study of patients with cutaneous melanoma, found that 19% of all melanoma patients had a history of 3 or more episodes of severe sunburn, while only 3% of the controls had such a history. With regard to age, Johnson and Lookingbill (1984) found that subjects 30 years of age and younger tended to use sunscreens more often than those subjects older than 30 years of age (50% vs. 40%) but this difference was not found to be significant. Furthermore, Hill et al. (1992) found that

young people were more likely to use sunscreen while older people were more likely to cover up with clothing.

Skin type may also contribute to determining whether or not people will engage in skin cancer prevention behaviors. Skin type is often categorized based on a person's response to the following question: Which of the following best describes your/your child's reaction to your/your child's first exposure to summer sun for one hour at midday? "A painful burn the next day and no tan one week later" (Type I); "A painful burn the next day and a light tan one week later" (Type II); "A slightly tender burn the next day and a moderate tan one week later" (Type III); "No burn the next day and a good tan one week later" (Type IV) (Fitzpatrick, 1988). Skin type has been shown to be an excellent measure of sun sensitivity and strongly associated with minimal erythema dose (sunburn) (Weinstock, 1992). Johnson and Lookingbill (1984) found that subjects with skin types I (always burn, never tan) and II (always burn, then tan slightly) tended to use sunscreen most often. Mermelstein and Riesenberg (1992) found similar results in that high-risk subjects used sunscreen significantly more frequently than did low-risk subjects.

Knowing people who have or had skin cancer is also related to sunscreen use (Keesling & Friedman, 1987). However, in a survey of 220 adolescents, Banks et al. (1992) found that parents were only slightly more likely to insist on sunscreen use in their children if there was a history of skin cancer in the family (75% vs. 62%, $p = .07$). Socio-economic status is another factor that may contribute to preventive behaviors. In a retrospective study of 1,804 cases of melanoma in Washington state, Kirkpatrick, Lee, and White (1990) found that melanomas are more common and the death rate is higher among the prosperous than the less well-off. This is likely due to the fact that the more

prosperous are able to afford vacations and time off during the day to engage in sun-related behaviors. Keeping this in mind, the cost of sunscreen is another important factor to consider. Stern et al. (1986) "estimate that applying sunscreen 50 times each summer from birth to age 18 years, for the average child, to the body areas where 90% of tumors occur would cost $310. In the southern parts, of course, the cost would be higher, but the number of tumors prevented would also be higher" (p. 540). Thus, the questions are who can afford to buy sunscreen and who is willing to purchase sunscreen? Banks et al. (1992) asked adolescents for suggestions to enhance the use of sunscreens and most replied that sunscreen use might increase if the products were less expensive.

Despite the health hazards associated with UV exposure, data indicate that a significant percentage of children and adolescents continue to engage in high risk behaviors. For example, surveys over the last several years revealed that over half of individuals studied intentionally worked on tanning or engaged in moderate to high sunlight exposure (AAD, 1988; Mermelstein & Riesenberg, 1992), and less than half reported using sunscreen on a regular basis (AAD, 1988; Banks et al., 1992; Mermelstein & Riesenberg, 1992) or knowing the sun protection factor of the sunscreen they were using (Grob et al., 1993).

The extent to which parents engage in skin cancer prevention behaviors for their children is an important, yet infrequently studied, aspect of prevention in general. Because children are generally too young to realize that this is a very important aspect of their health, parents are often relied upon to be informed about and practice these preventive behaviors. Although all of the correlates previously mentioned apply to everyone, including children, parents of young children have generally been neglected in

the skin cancer and sun protection literature. The studies that have been conducted regarding parent involvement include several aspects of sun protective behaviors. For example, Maducdoc, Wagner, and Wagner (1992) found that parents who applied sunscreen to their children had children who had experienced more painful sunburns. They also found that sunscreen users and non-users did not differ in terms of parental age. Grob et al. (1993) found that sun protective habits of mothers were predictive of level of sun exposure in children. Those who engaged in fewer sun protective habits for themselves exposed their children to more sun.

The perception of a tan looking healthy on their children may be a factor in preventive behaviors by parents. Maducdoc et al. (1992), in a beach-based study of 85 parents of children 12 years or younger, found that 81% of sunscreen users and 82.5% of non-users in their study held the opinion that a suntan looked healthy on their children. Seventy-eight percent of subjects in a Johnson and Lookingbill (1984) study believed that a suntan looks healthy. Additionally, 40% of parents in a Grob et al. (1993) study said they exposed their children to the sun for health benefit.

Lescano and Rodrigue (1997), in a beach-based survey of parents, found that most parents of young children reported the regular use of sunscreen on their children while at the beach or neighborhood pool (73%); however, a little over one-quarter (28%) reported using sunscreen regularly on their children before general outdoor activities. Furthermore, parents' reported use of protective clothing for their children was low (overall 36%). Bennetts, Borland, and Swerissen (1991), in a similar beach-based study, found comparable results. Only 48% of subjects were wearing sunscreen with an SPF of 15 or higher; 25% used nothing at all or used a lotion that afforded little or no protection.

Furthermore, they found that less than half of the body was adequately protected from the sun for children. Similarly, Cockburn et al. (1989) found that 70% of a sample of 3,002 students in Australia were classified as not using sun-protection measures and Grob et al. (1993) discovered that only 38% of adolescents used adequate sun protection measures.

Another factor that may contribute to preventive behaviors by parents may be receiving information from their pediatricians. Maducdoc et al. (1992) found that twice as many parents in the sunscreen-using group remembered being educated by a pediatrician about sun protection. Pupo, Sherertz, and Flowers (1986) interviewed Florida pediatricians and found that the majority consider sun protection a significant issue. Seventy-one percent said that they recommended sunscreen to most patients.

Children and their parents are not the only ones who are not engaging in sun protective behaviors. Grin, Pennoyer, Lehrich, and Grant-Kels (1994) found that day care center staff do not provide sun protective measures for the children in their care. In fact, the incidence of exposure to midday sun was very high for these children (96%).

The aforementioned figures suggest that children, adolescents, parents of young children, and other caregivers of children are either unaware of the health risks of sun exposure or have attitudes and beliefs that interfere with reducing health risks. Specifically, researchers have found that children and adolescents who report greater perceived susceptibility to skin cancer, more positive attitudes about the benefits of sun protection, and perceive fewer barriers to following recommended preventive behaviors are more likely to use sunscreen and to take precautions (Lescano & Rodrigue, 1997; Mermelstein & Reisenberg, 1992). Cockburn et al. (1989) found that although knowledge did not predict failure to engage in sun-protective measures, attitudes were

significant predictors. Thus, there is mounting evidence that efforts to understand skin cancer and its associated risk factors must include a multidimensional model comprised of individuals' constitutional characteristics, demographic factors, knowledge, beliefs, and attitudes as they relate to sun protection and skin cancer.

Skin Cancer Interventions

School-based. The literature regarding evaluations of school-based interventions is sparse to date. Few researchers have ventured into schools to increase children's sun protective knowledge, attitudes, and behaviors, although many more have examined these constructs in other settings. Those who have attempted interventions have gone in with differing tactics and have left with contrasting results. Although the ultimate goal is to increase protective behaviors, researchers are currently determining the factors that may lead to this behavior change and how best to manipulate these factors.

Several school-based interventions have increased children's knowledge and attitudes without success in changing behaviors or intentions. Goldstein and Lesher (1991) examined the effectiveness of a one hour educational intervention by a dermatologist and found that children's knowledge increased but attitudes and behavior were not affected. Hughes et al. (1993) found no significant difference in behavior of intervention groups compared to a control group. However, those who covered up in the sun, wore sunscreen, and sat in the shade had significantly better attitudes than those who did not behave in this way. Similarly, Mermelstein and Riesenberg (1992) conducted a brief school-based intervention to increase knowledge and preventive attitudes regarding skin cancer. They found that the intervention increased knowledge and perceived susceptibility to skin cancer but did not affect intentions to engage in protective behavior.

Fork, Wagner, and Wagner (1992) did not measure behavior but did examine children's ability to influence their peers' skin cancer knowledge. In five one-hour sessions, third- and fifth-graders were prepared to present factual information through the use of skits, question-and-answer sessions, and coloring books, to first-graders. The students were effective in increasing the first graders' knowledge as well. These results, however, are interpreted with caution given the sample size (n=16). Loescher, Emerson, Taylor, Christensen, and McKinney (1995) conducted an intervention vs. control group study in which they presented 4 and 5 year-old pre-school children with a Be Sun Safe curriculum. This curriculum consisted of lectures and interactive group activities. They found that the curriculum affected knowledge and comprehension of sun protection but not application of new concepts.

However, some interventions have proven effective in attaining behavior change or intentions to engage in protective behaviors. Ramstack et al. (1986) examined upper elementary and junior high students' knowledge, attitudes, and behaviors two months prior to a six-unit curriculum and immediately following the curriculum. They found that it is possible to increase protective behaviors by increasing knowledge but not affecting attitude. Girgis, Sanson-Fisher, Tripodi, and Golding (1993) assigned students to an intensive intervention, a standard intervention, or a control group. Students in the intensive intervention group were more likely to engage in more sun protective behaviors at posttest periods of 4 weeks and 8 months. Knowledge and attitudes were not significant predictors of protection. Buller, Loescher, and Buller (1994) developed and tested their Sunshine and Skin Health curriculum with 4th-, 5th-, and 6th-graders. They found that the curriculum increased knowledge immediately and six weeks later,

provided less favorable attitudes toward tanning, and increased favorable attitudes toward sunscreen use in 4th-graders. Behavioral changes were encountered, with an increase in preventive behaviors and a decrease in risky behavior, but these changes were inconsistent across the groups and were not persistent. The Arizona Sun Awareness Project was developed by Loescher, Buller, Buller, Emerson, and Taylor (1995) and included two curricula. The Sunny Days, Healthy Ways curriculum was developed for elementary school students, while the Be Sun Safe curriculum, as mentioned above, was geared towards preschool students. Sunny Days, Healthy Ways increased children's knowledge of exposure, cancer, and prevention immediately and following an 8-week post-assessment period. Less favorable attitudes toward tanning were enhanced and unfavorable attitudes toward the use of sunscreen were reduced. As is common in the health promotion literature, the curriculum more effectively influenced knowledge and attitudes than behaviors. A more recent study of the Sunny Days, Healthy Ways curriculum (Buller, Buller, Beach, & Ertl, 1996), found that the curriculum increased knowledge about skin cancer prevention and attitudes supporting prevention and decreased suntanning in fourth, fifth, and sixth graders. However, self-reported preventive behavior was not found to have been affected. Hoffmann, Rodrigue, and Johnson (in press) found that, compared to a no-intervention control group, elementary school students in an intervention group reported increased knowledge, intentions, and self-reported sunscreen use following a two-week post-intervention period. Attitudes and beliefs predicted intentions and reported sunscreen use for children in the intervention group.

In summary, several school-based interventions have been developed to promote sun protection. Many of these interventions lacked a control group, therefore making it very difficult to adequately assess the effectiveness of the intervention. Furthermore, given the lack of a "gold standard" for measuring sun protective behaviors, each of these studies examined protective behaviors differently. This may be the reason for the varied findings on behavior change. The interventions that were longer than 1 session tended to be more successful than briefer interventions possibly because the subjects were given more time to learn the information and were able to generalize the information. Finally, the missing ingredient in each of these interventions has been consideration of the family as a vehicle for initiating and maintaining protective behaviors learned at school. Families have been integrated successfully in other child and adolescent health promotion areas such as bicycle helmet use (Pendergrast, Ashworth, DuRant, & Litaker, 1992) and cardiovascular fitness (Arbeit, Johnson, Mott, Harsha, Nicklas, Webber, & Berenson, 1992).

Adult/community focused. Several interventions have been conducted with adults and in a community-based setting. Katz and Jernigan (1991), following a baseline assessment, presented high school and college students with a 25- to 30-minute information session regarding the skin, cancer, basic facts about skin cancer, and preventive measures. Data indicated that young adults' skin cancer and sun protection knowledge could be increased through a brief training program. Boutwell (1993) described the Under Cover Skin Cancer Prevention Project in which the media (newspapers, television, and radio) was used as a vehicle for skin cancer-related information. Skin cancer advisories and behavioral messages were provided to the public

four times daily through the summer months in several regions of Texas. These messages were intended to change knowledge and attitudes about sun exposure while promoting risk-reduction strategies. A telephone survey using random-digit dialing was conducted to collect baseline data. Researchers found high knowledge levels but low levels of self-reported sun-protective behaviors. Follow-up surveys conducted a year and two years later showed that these trends continued and Boutwell (1995) speculated that this was likely due to continued peer pressure and social norms that favored a "healthy" tan.

Cameron and McGuire (1990) reported that a national skin cancer prevention campaign in England and South Wales was effective in raising the public's awareness about the dangers of the sun and in promoting sun protection measures. The campaign consisted of magazine advertising, leaflets, and public relations activities. However, the campaign was not effective in changing the behavior of residents or in changing their maladaptive attitudes regarding suntans. The only statistically significant behavior change was in the reapplication of sunscreen by those who used sunscreen at all. Alarmingly, only 2 percent of the sample associated getting a tan with greater risk of skin cancer in the post-assessment.

Jones and Leary (1994) compared the effectiveness of health-based versus appearance-based messages on university students' intentions to engage in sun protective behaviors. They compared three essays and found that the essay that dealt with the negative effects of the sun on appearance was most effective in increasing intentions. One of the three essays described the health risks of sun exposure, while the other (the control essay) described the process by which tanning occurs. Thus, they concluded that

among young adults, stressing the negative effects of sun exposure on appearance may be more effective than warnings about the risks to one's health.

In 1989 the Texas Dermatology Society and the Texas Division of the American Cancer Society initiated a statewide Skin Cancer/Melanoma Awareness Campaign (Kelly, 1991). Using the media as its primary vehicle, the public was educated concerning prevention and early detection of skin cancer/melanoma. Adults were targeted at their worksites, while children in preschool through sixth grade and parents were reached through the schools. Pamphlets, posters, videos, and public service announcements were the primary means of education. Furthermore, hats and sunscreen samples were distributed. The campaign was found to be successful in several areas. The perception of the susceptibility of children to skin cancer was increased, as was the perception of melanoma as a serious illness.

Lombard, Neubauer, Canfield, and Winnett (1991) conducted a community-based intervention in which they used dissemination of information via posters and fliers, peer leader modeling, risk protection feedback and goals, and a commitment raffle to increase sun protective behaviors. They found that children, adults, and lifeguards, in particular, increased their use of protective behaviors which included use of a sunscreen, re-application of a sunscreen after swimming, wearing protective clothing, and reducing sun exposure during peak hours.

The Rhode Island Sun Smart Project (Rossi, Blais, & Weinstock, 1994) was designed to present skin cancer prevention information to beachgoers in Rhode Island. Seven interventions were investigated for their ability to effectively promote sun protective behaviors. These interventions include an educational pamphlet, free

sunscreen samples, sun sensitivity assessment and feedback, a sun scanner that dramatizes the extent of UV damage and photoaging, educational and dramatic videotapes, skin microtopography, and ultraviolet and polarized light instant photography. The primary concern of the researchers was the feasibility of each of these interventions in the beach setting. They found that the highest participation rates were for the pamphlet and photography interventions. Thus, based on their experience, they recommended that future beach-site interventions include pamphlets, sunscreens, sun sensitivity assessments, and photographs.

Operation Cover-Up was a two-week intervention implemented on the beaches of Australia with the goal of promoting skin cancer awareness (Watts, 1987). Several health workers distributed literature, stickers, and sunscreen. Furthermore, a Sid Seagull outfit was worn by one of the workers to appeal to the children on the beach. The author evaluated the effectiveness of this campaign by estimating the number of personal contacts and the amount of promotional material handed out. Of course, it is not known exactly how many people read the pamphlets or used the sunscreen; thus, the effectiveness of this intervention remains unknown.

As is apparent from the abundance of adult and community focused interventions, skin cancer prevention is currently being targeted effectively with these populations. In general, knowledge at baseline was high; however, sun protective behaviors were low at baseline and more resistant to change than knowledge and attitudes and beliefs.

Parent and family focused. Parent and family focused interventions have generally been neglected in this area. This is surprising given the establishment of effective interventions in other health promotion areas using a parent and/or family

component. For example, one of the studies that did include parents and examined the effect of this inclusion was done by Bolognia, Berwick, Fine, Simpson, and Jasmin (1991). They compared several methods of educating mothers of newborns about sun protection and found that low-level and high-level interventions were effective in reducing the amount of time the newborns were allowed to spend in direct sunlight, as well as reducing the amount of time mothers themselves spent in the sun. The low-level intervention consisted of a sheet of guidelines on minimizing sun exposure and a postcard reminding the parents to limit sun exposure. The high-level intervention group received the guidelines, sun protection pamphlets, sunscreen samples, a baby sun hat, and a sun umbrella.

Rodrigue (1996) conducted a school-based intervention (at Parent-Teacher Association meetings) with mothers of school-aged children to promote healthier behaviors, attitudes, and beliefs toward sun exposure. This study compared a comprehensive prevention program (CPP) to an information-only condition (IOC) and a no-information control group (NIC) and found that mothers in the CPP and IOC groups significantly increased their knowledge related to skin cancer and sun protection compared to the NIC group. He also found that the CPP condition displayed increases in protective behaviors and positive attitudes that were maintained at a 12-week follow-up. The CPP consisted of a didactic lecture regarding skin cancer facts and sun protective behaviors, group discussions about attitudes/beliefs, barriers, personal experience and getting children to change, and personal exposure to a melanoma survivor. The IOC group received only the didactic lecture.

Glanz, Chang, Song, Silverio, and Muneoka (1998) recently field-tested their Hawaii SunSmart program at outdoor recreation sites. The intervention consisted of a 4-week program that included staff training, group activities, take-home booklets, incentives for children and staff, the provision of sunscreen, and the promotion of sun safe environments and policies. The objectives were to increase knowledge, habits, policies, and norms related to skin cancer and sun protection among 6-8 year old children, their parents, and staff of recreational facilities. They found that their intervention increased knowledge, sun protection habits of parents, children, and staff, and changed policies and norms. Perhaps as important was the demonstration of the feasibility of implementing the intervention in such a setting.

Characteristics of Effective Interventions

Buller and Buller (1991) suggest that there are several characteristics that should be common to prevention efforts with children. They urge that the messages must stress social consequences of prevention; use two-sided appeals (i.e., "Although suntans make people look healthy, they can also cause wrinkling."), attractive sources, and testimonials; and emphasize positive effects of preventive behavior. Furthermore, having adolescents become actively involved in the intervention promotes learning and retention. Buller and Buller (1991) also provide strategies to increase knowledge and change or modify beliefs, attitudes, and behaviors. They indicate that one can increase skin cancer and sun protection knowledge by describing underlying principles, describing how to perform prevention behaviors, describing the consequences and/or benefits of engaging in protective behaviors, emphasizing the simplicity of trying new behaviors, and the observability of the consequences. They contend that beliefs and attitudes can be

changed by emphasizing perceived vulnerability, making concrete recommendations, providing evidence from highly credible sources such as pediatricians, highlighting social support, using intense language and two-sided appeals, and providing cues to action.

Cockburn et al. (1989) suggest a multifaceted intervention that modifies beliefs based on the dimensions that predicted the failure to use sun protective measures in the first place. They indicate that this can be done by emphasizing the benefits of sun protection while trying to surmount the barriers and by glamorizing the practice of covering up by making it attractive and acceptable (i.e., related to a positive image). Furthermore, Cockburn et al. (1989) suggest encouraging parents to exert more influence in this area and to model appropriate behavior.

Hoffmann et al. (in press) point to several characteristics of effective interventions specifically targeted toward changing behaviors. They indicate that these interventions are multimodal, model-driven, last longer than 1 class period, incorporate parent or community involvement, and include the practice of targeted healthy behaviors. Similarly, strategies for effective intervention to increase knowledge and more positive attitudes include providing information about health risk, discussing the benefits of engaging in risk-reducing behaviors, altering social norms, and providing specific instructions on how to practice healthy behaviors.

Efforts to involve parents in children's health promotion have not been encouraging, primarily due to the difficulties in recruiting and maintaining substantial parental participation (Perry, Luepker, Murray, Kurth, Mullis, Crockett, & Jacobs, 1988). Thus, creating interventions that reach parents in a time- and location-effective manner will be most successful in acquisition and retention of parents and families.

Rationale for Intervening with Children/Adolescents

Health-related beliefs, attitudes and behaviors developed during childhood can influence adolescent and adult health problems. It is suspected that during childhood the individual develops certain general and specific self-perceptions, beliefs about health and its value, a sense of control over health, and health-related behavior patterns that influence later health behaviors as individuals continue to mature to adulthood (Bruhn & Parcel, 1982). Furthermore, preventive behaviors learned early in life may be less resistant to change than those learned in adulthood (Tinsley, 1992). Johnson, Nicklas, Arbeit, Franklin, and Berenson (1988), in examining a family health promotion program, found that factors that contributed to long-term change included addressing children in the early formative years (10-12) before life-style habits are rigidly established, including the entire family system, and teaching family members to use intrafamily social reinforcement.

Children 10-12 years old are appropriate for prevention programs because family influence is still strong despite this age group being in transition to more independent thinking and acting (Nader et al., 1986). Preliminary evaluations have provided evidence that health behavior can be changed if children are appropriately motivated through personally meaningful classroom activities, projects, discussions, and peer group experiences (Williams, 1980).

Rationale for Intervening with Families

The rationale for including families in health promotion activities is based primarily upon Social Learning Theory (Bandura, 1977, 1986). The family is the basic social unit, and it is largely through family influences that children gain their attitudes,

knowledge and early practices regarding health (Nader et al., 1986). Baranowski, Nader, Dunn, and Vanderpool (1982) state that "the health behavior of several people should be affected more efficiently and permanently by direct work with families" (p. 162). Family members can act as teachers, role-models, and providers of positive and negative consequences for engaging or not engaging in sun protective behaviors.

To have an impact on the behaviors of children and adolescents, it is also important to change the attitudes of their parents toward sun exposure and suntanning (Marks, 1987). In 1981 a conference entitled "The Health Behavior of Young Children: Research Findings and Directions" took place in Galveston, Texas (Bruhn & Parcel, 1982). Participants agreed on several issues with regard to family influences. They agreed (1) that parents can be powerful role models as well as teachers of children's health behaviors and (2) that interventions can be designed to promote the health of children by modifying practices of the family. Furthermore, several assumptions were put forth regarding children's health behavior. Their parents' health behavior and the environment in which they live affect children significantly. Parents provide the most important opportunities for adoption of healthy habits by their children. For instance, Chassin, Presson, and Sherman (1984) concluded from their research in the area of smoking cessation that among younger adolescents, smoking cessation may be more related to parental influences than to peer influences. Furthermore, they concluded that social environmental factors in the form of peer and parental influences are more important for adolescent smoking cessation than are specific beliefs about the health risks and controllability of smoking.

Thus, success of primary prevention efforts may rely on educating parents to provide appropriate modeling and support (Perry, Crockett, & Price, 1987). Perry et al. (1987) report that parents will make changes in their own health behavior or attitudes when interventions are aimed not at them, but at their children in a school setting. This can be achieved by providing more flexible educational methods, such as printed materials or activities that can be completed at home with their children, an approach that parents appear to prefer.

Conceptual Models

Providing an explicit theoretical basis for a study allows a frame of reference, determines the type of research design, the approach for analyzing the data, and a formulation for the interpretation of results (Wallander, 1992). Ingham and Bennett (1990) identified several conceptual models that have been used by health psychologists working in the community health arena. In the proposed study, components of Cognitive Development Theory, the Health Belief Model, the Theory of Reasoned Action, self-efficacy theory, and Social Learning Theory are drawn from to conceptualize skin cancer prevention behavior. The decision to focus on these five models as the conceptual backdrop for the proposed study was made for two reasons. First, the use of a conceptual model or theoretical formulation a priori represents a significant advancement over the skin cancer literature base that has been generally void of theory. Second, specific components from each of these five theories, whether the investigators were aware of them or not, have been used to conceptualize and to predict risk-reduction behavior in both the skin cancer literature (e.g., Cody & Lee, 1990; Keesling & Friedman, 1987; Mermelstein & Riesenberg, 1992) and in other health related areas (Aspinwall, Kemeny,

Taylor, Schneider & Dudley, 1991; Strecher, DeVellis, Becker, & Rosenstock, 1986). A brief review of significant aspects of these five conceptual approaches follows.

Cognitive Development Theory (CDT) suggests that stages of development are a result of cognitive processes rather than from responses to parents or peers. With regard to health knowledge, children's ideas of health and illness begin to resemble those of adults in the concrete operational stage. In the formal operational stage, the more sophisticated concepts are understood, such as infection and preventive behavior (Simeonsson, Buckley, & Monson, 1979). Thus, the importance of the CDT in this study lies in the fact that children must be able to understand the assessment and intervention material and, beyond that, must be able to conceptualize "health" and "protective behavior" among other terms. However, these terms were operationalized to be more specific for this population.

The Health Belief Model (Becker, 1974; Rosenstock, 1974) postulates that health-related decisions are based on consideration of both the costs of a health protective action as well as the likelihood that the action will reduce the occurrence or the severity of the illness. Although it has been revised, the model has maintained its five primary components: perceived benefits of taking action to reduce risk, barriers to taking action, perceived susceptibility or vulnerability to the illness, perceived severity of the illness, and cues to action. In the case of skin cancer prevention, perceived benefits of modifying sun exposure activity might be the reduction of immediate physical side-effects (e.g., painful sunburn) and/or long-term ramifications (e.g., premature aging of skin, skin cancer), while perceived barriers to initiating or maintaining health promotion behavior might be psychological (e.g., view tan as more attractive) and/or financial (e.g., high cost

of some sunscreen products) in nature. Perceptions of vulnerability are likely to be determined by individuals' understanding of the nature and etiology of skin cancer, the extent to which individuals engage in activities or behaviors that put them at risk, and their conception of the notion of risk. The Health Belief Model also postulates that individuals must be aware of the severity of the disease or illness before they will be motivated to reduce the behaviors that place them at high risk. Finally, cues to action that serve to trigger health-related behavior can be either internal or external in nature. Examples of internal sensations include painful sunburns; external events might include billboard advertisements for sunscreen products, a television documentary on skin cancer, or other media communications.

The Health Belief Model has undergone extensive empirical scrutiny and has demonstrated its utility in predicting a wide range of health behaviors (Janz & Becker, 1984). It has been criticized, however, for not having the ability to describe the mechanism through which these variables are translated into actual behavior change (i.e., they are simply descriptive indicators; Prentice-Dunn & Rogers, 1986). The Health Belief Model has been applied to children in several health arenas such as expected medicine use (Bush and Iannotti, 1990), diabetes (Bond, Aiken, & Somerville, 1992), and helmet use (Witte, Stokols, Ituarte, & Schneider, 1993). Bush and Iannotti (1990) called their model the Children's Health Belief Model and proposed that demographic, cognitive/affective, enabling, and environmental factors be added to the already established factors of the original Health Belief Model. They found that the original Health Belief Model factors of severity and benefit contributed most the prediction of

medicine use. Cognitive/affective factors (e.g., children's health locus of control) mediated the paths between demographic factors and HBM factors.

An aspect of the Theory of Reasoned Action, Behavioral Intention Theory (BIT) proposes that behavior is predicted by behavioral intention, which in turn is predicted by attitudes and subjective norms (Ajzen & Fishbein, 1980). It is a value-expectancy model that relates behavior to cognitions, with intention as the mediating variable. BIT emphasizes specific behaviors rather than abstractions, which many children may not be prepared for. However, Arthey and Clarke (1995) indicate that self-reports of intention should be interpreted cautiously, as the strong social influence component of suntanning and sun protection may result in people responding with the intention they believe is socially expected rather than their actual intention.

Similar to the HBM, Bandura's (1977, 1986) self-efficacy theory suggests that knowledge of effective risk reduction strategies does not necessarily lead to behavior change. Individuals may have knowledge about what to do and genuinely believe that such behavior would reduce their risk for skin cancer; however, they might view themselves as unable to carry out the behavior. In other words, they lack the conviction that they can successfully execute the desired behaviors (i.e., self-efficacy). Research evidence substantiating a relationship between self-efficacy and health promoting behaviors has been reported in the areas of smoking, weight control, contraception use, exercise, and alcohol abuse (Bandura, 1992; Beck & Lund, 1981; O'Leary, 1985; Strecher et al., 1986).

Social Learning Theory suggests that behaviors can be changed according to the positive and negative consequences of the behavior (Bandura, 1977; 1986). Thus, people

in a child's environment, such as teachers, classmates, parents, and other family members, can influence the child's behaviors through these consequences and through vicarious learning, in which these persons model behavior. Self-efficacy is an important part of Social Learning Theory and has been described earlier in this paper. Arthey and Clarke (1995) state that any theory that is used to direct research in the behavioral prevention of skin cancer must have a social influence component to account for the pressures of peers and fashion that are important in people's desire to have a suntan. Furthermore, application of psychosocial theory, with an emphasis on role models, rehearsal, goal-setting and reinforcement, appears to be effective even in a correspondence-activity format, although only when participation rates are high (Perry et al., 1988).

In sum, the predictive model postulates that children must be cognitively prepared to receive health promotion messages and to change their cognitions in order for the intervention to be effective. If children are at an appropriate age level and the material presented is consistent with this age level, then an attempt is made to alter attitudes and beliefs, specifically, perceived vulnerability to skin cancer, perceived severity of the disease, barriers to engaging in protective behavior, benefits of engaging in protective behavior, costs of engaging in exposure behaviors, and cues to action. According to BIT, when attitudes are significantly altered, this can lead to increased intentions, which may lead to increased protective behaviors. This mechanism is mediated by positive and negative consequences and vicarious learning from significant others, as hypothesized by the SLT. Finally, these children must believe that they can carry out these behaviors in order to obtain and retain significant behavior change.

Specific Aims and Hypotheses

In light of the foregoing review, the purpose of this study was to expand the current research base on effective school- plus home-based interventions. Specifically, this study examined the extent to which adding a family component to an intervention with established efficacy increased children's sun protection knowledge, positive attitudes and beliefs, intentions, and behaviors. Furthermore, the predictive utility of the proposed model was assessed with regard to its usefulness in predicting sun protective intentions.

Based upon previous sun exposure and skin cancer prevention intervention literature, the following hypotheses are put forth.

1. Children in the School-Plus-Home intervention (addition of the family component) will report: (1) greater knowledge, (2) more positive attitudes and beliefs, (3) greater intention to engage in sun protective behaviors, and (4) more sun protective behaviors at post-test and follow-up than before the intervention. This hypothesis is made based on previous literature (Hoffmann et al., in press) which found that subjects in the intervention group reported significantly increased knowledge, intentions, and self-reported sunscreen use at the two-week post-intervention period compared to baseline assessment. Furthermore, research in other areas of health promotion in which the inclusion of families significantly improved the effectiveness of the interventions for bicycle helmet use (Pendergrast et al., 1992), seat belt use (Morrow, 1989), and cardiovascular fitness (Arbeit et al., 1992) is drawn from to propose this hypothesis.

2. Children in the School-Plus-Home intervention will report: (1) greater knowledge, (2) more positive attitudes and beliefs, (3) greater intention to engage in sun protective

behaviors, and (4) more sun protective behaviors than children in either the School group or no-intervention Control group in the post-intervention period. Again, this hypothesis is made based on previous literature (Hoffmann et al., press) which found that subjects in the intervention group reported significantly increased knowledge, healthier attitudes and beliefs, increased intentions, and self-reported sunscreen use at the two-week post-intervention period compared to a no-intervention control group and research in other areas of health promotion that included a family component.

3. Children in the School group will report greater knowledge, more positive attitudes, greater intentions, and more protective behaviors than those in the Control group at both the post-test and follow-up. This hypothesis is made based on previous literature (Hoffmann et al., in press) which found that students in the intervention group reported significantly increased knowledge, healthier attitudes and beliefs, increased intentions, and self-reported sunscreen use at the two-week post-intervention period compared to a no-intervention control group.

4. More positive attitudes and beliefs and greater report of engaging in sun protective practices in the past week will be significantly predictive of higher behavioral intentions to practice sun protective behaviors pre-intervention. Furthermore, these factors along with which intervention a child received will be predictive of post-intervention intentions. This hypothesis is made based on previous research (Hoffmann et al., in press) in which it was found that attitudes and beliefs contributed 8% of the variance and pre-intervention intention score accounted for 29% of the variance in post-intervention intentions for the intervention group. Furthermore, 20% and 45% of the variance in post-intervention intentions for the control group were found to be accounted for by attitudes and beliefs

and pre-intervention intention scores, respectively (Hoffmann et al., in press). In the current study, all three groups were combined to attempt to predict intentions and behaviors. Post-intervention intentions were added to the previously stated variables to attempt to predict specific behaviors of sunscreen use, shade use, long-sleeve shirt use, and hat use. Demographic variables, sun protection variables, and knowledge were not found to be significantly predictive of intentions or behaviors in the Hoffmann et al. study. All demographic and sun protection variables were examined here but were not expected to contribute significantly to the variance in intentions or behaviors. Based on previous research, it was predicted that pre-intervention intentions will contribute most significantly to predicting post-intervention intentions (Hoffmann et al., in press) and that attitudes will contribute significantly, as well. Post-intervention intentions were hypothesized to contribute significantly to the prediction of self-reported sun protective behaviors. Figure 1 demonstrates the hypothesized conceptual model for this study.

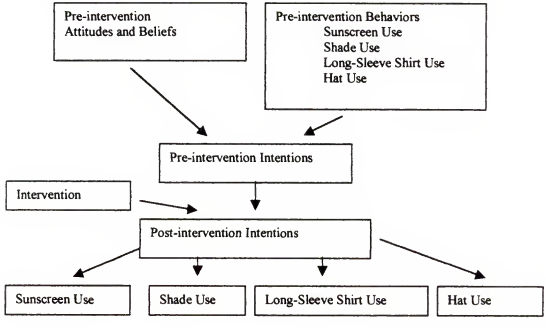


Figure 1
Hypothesized Conceptual Model for Predicting Sun Protection Intentions and Behaviors

METHOD

Subjects

Subjects were 203 fifth-grade children from eight elementary schools in Levy, Bradford, and Clay counties in North Central Florida. Each school was randomly assigned to one of three conditions: a no-intervention Control group, a School intervention group, and a School-Plus-Home intervention group. Random assignment of schools (as opposed to children) was made to decrease the likelihood of contamination effects given that the intervention involved environmental changes and it would have been impossible to control the flow of information between children who attend the same school. Subjects were recruited through a consent form that was sent home with the children requiring parental signature. Parents were advised, through teacher signature on the consent form, that this project was an accepted and recommended part of their child's curriculum. Of 319 total consent forms sent home to parents, 206were returned. Participation rates for each group were as follows: 74% School-Plus-Home, 64% School, and 53% Control.

Measures

All measures can be found in the Appendix. A demographic questionnaire, which assembled information regarding child and parent skin type, education level, employment, family composition, skin cancer history, and attitudes toward sun exposure, was completed by consenting parents. Additional questionnaires were administered in a group format to children and were read aloud to them.

Knowledge scale. A 17-item Knowledge Scale assessed children's knowledge of sun exposure risks and sun protection. This measure was developed by Johnson (1988) and was modified for use in earlier studies (Hoffman et al., in press; Kubar, Rodrigue, & Hoffmann, 1995). Wording for several of the items on this measure was changed by the current author to eliminate the possibility of response bias and 4 new items were added to strengthen its psychometric properties. Furthermore, "Don't Know" was added as an option for the True/False questions. Scores can range from 0-17, with higher scores reflecting more sun protection knowledge. Sample items include:

"You can get a sunburn on a cloudy day." True False Don't Know

"The riskiest time to be in the sun is:"

a. 7 am to 9 am b. 10 am to 3 pm c. 4 pm to 6 pm d. don't know

Internal consistency reliability (Cronbach's alpha) for this measure, computed across the entire sample at each of the three time points, ranged from .61 to .72.

Attitudes and beliefs scale. The 20-item Attitudes and Beliefs Scale assessed children's perceptions of sun exposure risks (i.e., perceived vulnerability α= .02-.23 and severity α = .28-.56), costs/benefits of engaging in sun protective behaviors (α = ..33-.60), benefits of engaging in exposure behaviors (α = .30-.57), barriers to engaging in sun protective behaviors (α = .27-.51), social cues (α = .39-.56), and self-efficacy (α = .38-.66). This scale was rationally derived and has been used in previous studies (α= .65-.72, 2-week test-retest r=.68; Hoffmann et al., in press). Five items were added to improve internal consistency and reliability. Internal consistency reliability (Cronbach's alpha) for the current study ranged from .70 to .79 for the total scale (including the five added items). Items are based on a 5-point Likert scale, with the anchor points of 1 (strongly

agree) and 5 (strongly disagree). Scores, ranging from 20 to 100, were derived by adding the items. A lower score on the scale indicates healthier attitudes and beliefs toward sun exposure and protection. Additionally, scores for each construct within the attitudes and beliefs scale were derived. Sample items include:

"People my age cannot get skin cancer when they are older" (Vulnerability)

"Skin cancer is a dangerous disease" (Severity)

"Wearing sunscreen will keep you from getting a sunburn" (Benefits of Protection)

"Laying out in the sun is healthy for me" (Benefits of Exposure)

"It is too much trouble to put on sunscreen" (Barriers)

"My parents think that wearing sunscreen is a good thing" (Social Cues)

"I am able to put on sunscreen to protect myself from the sun" (Self-Efficacy)

Intentions scale. The Intentions Scale has 6 items and was designed to assess children's reported plans to engage in sunscreen use across several situations. Items on this scale were derived from previous research on intentions to engage in health-protective behaviors (e.g., Abraham, Sheeran, Spears, & Abrams, 1992). Previous research (Hoffmann et al., in press) has shown that the Intentions Scale has good internal consistency (alpha=.74-.85) and adequate test-retest reliability (r=.68). Internal consistency reliability (Cronbach's alpha) ranged from .84 to .92 in the current study. The scale is based on a 5-point Likert scale ranging from 1 (strongly agree) and 5 (strongly disagree). Scores can range from 6 to 30, with a lower score indicating a stronger intention of engaging in protective behaviors. Sample items include:

"Next time, I intend to put sunscreen on when I am at the pool or beach."

"Next time, I intend to put sunscreen on when I am playing outside."

My outdoor activity sheet (MOAS). This measure was developed by the author to assess children's self-reported sun protective behaviors within the past week. Children were asked to list outdoor activities engaged in during the past week. They then indicated (yes/no) whether they wore sunscreen, a hat, a long-sleeve shirt, and stayed in the shade during that activity. A percentage (# of times protected/ # of times exposed) was derived for each of the four sun protective behaviors and overall.

Sun protection recall interview (SPRI). The Sun Protection Recall Interview was developed for this project and consisted of questions regarding protective behaviors engaged in within the past 24 hours. A random sample of children (about 35% per group) and one of their parents were contacted by telephone during the post-intervention period and asked to describe outdoor activities engaged in during the previous day, whether or not a parent was present, the time engaged in the activity, and whether sunscreen, protective clothing, and shade were used. Furthermore, if sunscreen was used, children were asked to provide the SPF of the sunscreen. Phone calls were made on 9 of the post-intervention days. This measure was scored by dividing the total time protected by the total time exposed to arrive at a percentage score of sun protective behaviors. Johnson (1991) reported that 24-hour recall interviews can provide adequate data if the focus is on specific behaviors reported over a recent, brief period. Furthermore, evidence indicates that telephone interviews may actually be more accurate than personal interviews (Weeks, Kulka, Lessler, & Whitmore, 1983). Perry et al. (1988) found that the participation rate for phone surveys in their study was 95 percent and that, in fact,

parents preferred this method to having to go somewhere to complete a questionnaire or engage in other activities.

Permanent products index. As a further behavioral index, a permanent products index was used in this study. Containers filled with the same number (100) of sunscreen packets (.5 oz., SPF 20) were placed in each of the eight schools. Children in all schools were told of the availability of these packets and were encouraged to use and return as many packets as they needed. The Index was the number of full packets taken per student, as well as the number of empty packets returned per packets taken per student for all three groups, at the end of a one-week period beginning the first day of the intervention. Johnson (1991) indicates that permanent product indices can be used as an effective tool to supplement other assessment methods. Hoffmann et al. (in press) found that subjects in the intervention group took (3.05 packets taken/student) and returned (.60 packets returned/student) a greater proportion of packets than did the control group (.55 and .10, respectively).

All questionnaires used in this study, except My Outdoor Activity Sheet and the Sun Protection Recall Interview, have been examined for reliability and validity and have demonstrated adequate psychometric properties in previous studies (Hoffmann et al., in press; Kubar et al., 1995) and in the current study.

Procedure

This study was conducted in the Spring of 1997. Approval was granted by the University of Florida Health Science Center Institutional Review Board and the School Board of Levy, Bradford, and Clay counties. Times for administering questionnaires and

the interventions were arranged with principals and teachers of the individual schools. Parent consent forms were given to each child to take to their parent(s).

Assessment. Both experimental groups and the control group were administered all study questionnaires. Immediately following the pre-test period, the control group received no intervention and the intervention groups received interventions as outlined below. Two weeks following the interventions, the post-testing was conducted for both intervention groups and the Control group. Children and parents were not informed of the post-testing or the follow-up testing so as not to influence their behaviors or reported behaviors beyond what they might have intended to do. Teachers were informed about the post- and follow-up testing. A five-week follow-up assessment was also conducted. Pre-, post-, and follow-up testing questionnaires were identical. The Control group received the School-Plus-Home intervention following the follow-up testing period.

Intervention. The school portions of the current study are replications of the Hoffmann et al. (in press) study. The difference between the two studies is the current emphasis and evaluation of the home component. For example, subjects in the intervention group in the Hoffmann et al. (in press) study were given a non-optional homework assignment to review with their parents an informational brochure that highlighted the sun's effects on the skin and identified ways to reduce sun exposure at home. There was no manipulation check to examine whether the children had completed the homework with their parents. Furthermore, there were no other homework assignments given in the Hoffmann et al. (in press) study, whereas in the current study, homework assignments were given each day to the School-Plus-Home group as outlined below.

Day 1 (50-minute session). Children in both the School and the School-Plus-Home interventions received the following: a lecture demonstrating the sun's effect on the skin, potential risk factors, and a review of prevention behaviors. A 10-minute videotape (Slip, Slap, Slop; Anti-Cancer Council of Victoria) was shown which focuses on the behaviors necessary to avoid the negative effects of the sun. Furthermore, those children in the School-Plus-Home intervention were given a brochure and a poster (For Every Child Under the Sun; Skin Cancer Foundation) to discuss with their parents and to display in their home. Furthermore, they took sunscreen home to their families and showed them how to apply sunscreen properly. This was planned because rehearsal of appropriate behavior is an important step toward behavior change (Bandura, 1977). As a manipulation check for family activities, scorecards were given to the children that were taken home each day and signed by parents and children after doing homework. When the children returned the scorecards to school the next day, they were given points that were recorded on a chart in the classroom. Those children earning the maximum number of points received prizes (e.g., pencils, frisbees, stickers, etc.).

Day 2 (50-minute session). Children in the School-Plus-Home intervention reviewed their homework assignment. All children created artwork promoting sun safe behaviors. This artwork was displayed in the schools for the two weeks between the intervention and the post-testing. The development of a sunsafe television commercial was initiated. Children in the School-Plus-Home

intervention took home a sheet of drawing paper so that they and their parents could draw a sunsafe poster together. They were asked to display this poster in their home. All participants signed the scorecard. The rationale for using posters and commercials in the initial intervention was to enhance peer support and encourage public promotion of sun protective behaviors (Hoffmann et al., in press).

Day 3 (50-minute session). Children in the School-Plus-Home intervention reviewed their homework assignment. Children in both intervention groups completed their videotaped commercials. Children showed their posters to classmates and watched the videotapes. Finally, all children were asked to sign a commitment poster. Those children in the School-Plus-Home intervention were asked to take a commitment poster home to their family and have their family members sign it and post it visibly in their home. Cialdini (1984) believes that this is an essential intervention component because a public commitment makes the attitudes more apparent to all.

Table 1 shows the theoretical constructs that are associated with each of the intervention components.

Table 1
Intervention Components and Theoretical Constructs

Intervention Component	Theoretical Construct
1. Lecture on skin cancer, preventive behaviors	1. HBM severity, vulnerability, barriers, benefits
2. 10-minute Slip, Slop, Slap video	2. HBM cues, benefits; self-efficacy
3. Model and apply sunscreen at home and school	3. SLT; HBM barriers
4. Create artwork	4. HBM cues, benefits
5. Videotaped commercials	5. SLT; BIT; self-efficacy
6. Commitment posters	6. SLT; BIT; HBM cues
7. Brochure and poster to discuss with parents and display in home	7. SLT; HBM severity, vulnerability, barriers, benefits, cues

RESULTS

Treatment of Missing Data

Because of the nature of the sample (school-based), there are several data points missing for the dependent measures. It is assumed that these missing data are due to the random event of absence from school. Children who were missing both post- and follow-up assessments were excluded from analysis (n=3). Eight children did not complete the 2-week post-intervention assessment and there was an even distribution throughout the eight schools and, consequently, throughout the three groups. Thirty children did not complete the 5-week follow-up testing. Again, the missing data were evenly distributed across schools and groups. Furthermore, there were no significant differences between those with missing data and those with complete data on either categorical ($X^2 > .05$) or continuous ($p > .05$) demographic and sun-protection variables. Thus, in order to preserve statistical power and decrease the risk of a Type II error, all children with at least two time points of data were included in the analyses. The statistical approach used to deal with these missing data was to impute missing values using an estimation method called linear trend at point, in which the existing series is regressed on an index variable scaled 1 to n. Missing values are replaced with their predicted values (SPSS, 1997).

To evaluate whether outcome would differ if children with missing data were dropped, analyses were conducted using only those with complete pre-, post-, and follow-up data (n=165). For these children, no differences were found at pre-test on the

dependent measures (p's > .05) across groups. However, an analysis of covariance (ANCOVA) for MOAS (child self-report of sun protective behaviors) revealed a significant effect for Time, $F(1, 160) = 5.01$, $p = .027$, which was not found when analyses were conducted with the entire sample. Furthermore, there was a significant main effect for Time, $F(1, 156) = 3.14$, $p = .046$ for the completers-only data. The only other significant difference between the analyses of the completers-only and the data of the entire sample (with imputed missing values) is that, for intentions, a main effect for Time, $F(1, 197) = 6.96$, $p=.009$, was found to be significant using the entire sample ($n=203$) but not for completers-only data ($n=165$). All other effects were noted to be similar for both sets of data; however, stronger effects, with regard to power and p-values, were found for the data set that includes the entire sample.

For the intervention groups, the School group and the School-Plus-Home group, children were required to be involved in three days of sun protection related activities. Attendance was kept for the children in these groups. Twelve children, six from each of the intervention groups, were absent for at least one of the intervention days. These children were compared, using the Welch's t statistic because of unequal sample sizes and variances, to children who attended all components of the intervention. It was discovered that children who missed at least one intervention day differed significantly from those who were present every day on the pre-test measure of intentions, $t(10)=2.82$, $p=.05$, with the children who were absent having higher pre-test intentions. Furthermore, they differed on post-test intentions as well, $t(18)=3.64$, $p=.05$, again with the children who were absent for an intervention day having significantly higher intentions than those who were present all days. This did not differ according to which day was missed (i.e.,

children who missed either Day 1, Day 2, or Day 3 scored, on average, higher on intentions than those who were present for every day of the intervention.). Furthermore, Welch's t-statistics were conducted to examine whether children differed depending on which day of the intervention was missed. No differences were found for Time 2 (post-intervention) intentions among children who missed a day of the intervention. In fact, the means for these children were very similar. Children who missed Day 1 had a mean score of 8.0, those who missed Day 2 had a mean score of 8.4, while those who missed Day 3 had a mean score of 8.5. The effect for intentions dissipated over time as no effect was found for the follow-up assessment. All other dependent variables did not significantly differ between these two groups.

With regard to the School-Plus-Home group, participation in home activities was monitored and evaluated. Eleven (15%) of the children in the School-Plus-Home group did not have complete scorecards returned to school after the third day of the intervention. The assumption is made that these children did not participate in the home activities with their families; however, there is no way of knowing whether this assumption is accurate. Children who were absent were allowed to take their homework home the next day and complete it. It is known that two of the eleven might not have completed the homework because they were absent. However, the other nine who did not complete their homework were not absent for any portion of the intervention. They may have participated in some of the home aspects but not others and, again, it is unknown which portion may have been missed. Having or not having completed homework was not significantly associated with any of the demographic variables. Furthermore, these

children were included in all analyses and did not differ from those who completed their homework on pre-test, post-test or follow-up measures.

Description of Sample

Demographic and sun protection-related characteristics of the subject sample are presented in Tables 2, 3, 4, and 5. Ninety-two percent of the children were Caucasian, and there was a fairly even distribution of males and females. Twenty-three percent of the children were in a single-parent home. Average child age was 10.8 while average parent age was 36.6, who were, on average, high school graduates. Using the Hollingshead Index (1975), average socioeconomic status was 39, which falls in the third social stratum.

Parent report of skin type indicated that the greatest proportion of children and parents had skin type III. On average, children in the study had one severe sunburn in their lifetime. Parents reported, on average, four severe sunburns in their own lifetimes. On average, children and parents in North Central Florida visited a beach 4 times in the past year and spent 4 hours there each time. Parents reported that they would allow their children more responsibility for their own sun protection at the average age of 13. Ninety-two percent of the children had sunscreen available to them at home.

With regard to child age, parent age, parent education, spouse education, and SES, no differences were found among groups ($p > .05$). Furthermore, chi-square analyses revealed that there were no differences among groups with regard to race, child gender, number of parents in the home, or social strata ($X^2 > .05$). With regard to sun protection-related variables, chi-square analyses indicated that the groups differed only on information received from their pediatrician. More parents of children in the Control

group reported receiving information from their pediatrician in the last 12 months than those in the School group, X^2 (1)=5.99, p=.01. This difference was noted to be due to parents of children at Bronson Elementary reporting a higher incidence of having received information (30% yes, 70% no) rather than the Control group as a whole.

Furthermore, with regard to number of visits to the beach in the past year, an analysis of variance (ANOVA) and subsequent Student-Newman-Keuls post-hoc analyses revealed that children in the School group averaged more visits to the beach than children in the other groups, F(2, 173)=7.07, p=.001. Again this difference was noted to be due to children at Cedar Key Elementary (M=12.1 visits per year) rather than the school group as a whole.

Between and Within Groups Effects (Hypotheses 1-3)

Means, standard deviations, and significant effects for the Knowledge Scale, Attitudes and Beliefs Scale, Intentions Scale, and My Outdoor Activity Sheet (MOAS) at all three time points for each group are presented in Table 6. Figure 2 graphically displays these means. Repeated measures analyses of covariance (ANCOVA), using the pre-test score as the covariate, were conducted to determine significant differences among groups on each of these measures. Additionally, significant main and interaction effects were examined using simple effects and post hoc comparisons. Effect sizes were also calculated to further examine within and between-group differences. Effect size estimates for within-group comparisons are presented in Table 7 and between-group comparisons are presented in Table 8.

Knowledge. A 3 (Group) X 2 (Time) repeated measures ANCOVA on knowledge total score indicated a significant Group main effect, F(2, 199) = 63.00, p =

.001, and a significant Group X Time interaction, F (2, 199) = 3.92, p = .021. No significant effects were found for the main effect of Time. Regarding Group effects, post hoc analyses, with Bonferroni correction, revealed that all groups differed at both the post-intervention assessment and the 5-week follow-up assessment, with the School-Plus-Home group having more knowledge increase than the School group and the School group having more knowledge increase than the Control group. Post hoc analyses also revealed that all 3 groups showed some knowledge improvement over time, but the intervention groups' knowledge scores increased significantly more than the Control group at both the post-intervention assessment and the 5-week follow-up assessment.

As indicated in Table 7, knowledge effect sizes for the School-Plus-Home group were 2.00 (pretest to posttest), .13 (posttest to follow-up), and 1.80 (pretest to follow-up). For the School group, effect sizes were 1.42 (pretest to posttest), 0 (posttest to follow-up), and 1.50 (pretest to follow-up). The Control group effect sizes were .29(pretest to posttest), .35 (pretest to follow-up), and .63. Between-group effect sizes for were .36 (School-Plus-Home and School groups), 1.55 (School-Plus-Home and Control groups), and 1.2 (School and Control groups) at the 2-week post-test assessment and .22 (School-Plus-Home and School groups), 1.06 (School-Plus-Home and Control groups), and .89 (School and Control groups) at the 5-week follow-up assessment.

Attitudes and beliefs. A 3 (Group) X 2 (Time) repeated measures ANCOVA for Attitudes and Beliefs total score was significant for a main effect of Group only, $F(2,199) = 4.74$, $p = .010$. The School-Plus-Home group differed significantly from the Control group, with the School-Plus-Home group endorsing more positive attitudes and beliefs following the intervention (at the posttest).

It should be noted that, assuming improvement within groups, negative effect sizes should be expected for attitudes and beliefs. Effects sizes for the School-Plus-Home group were -.20 (pretest to posttest), .10 (posttest to follow-up), and -.11 (pretest to follow-up). For the School group, effect sizes were -.02 (pretest to posttest), -.06 (posttest to follow-up), and -.11 (pretest to follow-up). Effect sizes for the Control group were .29 (pretest to posttest), .09 (posttest to follow-up), and .37 (pretest to follow-up). Between groups effect sizes were -.25 (School-Plus-Home and School groups), -.26 (School-Plus-Home and Control groups), and .02 (School and Control groups) at the 2-week post-intervention assessment and -.26 (School-Plus-Home and School groups), -.28 (School-Plus-Home and Control groups), and 0 (School and Control groups) at the 5-week follow-up assessment.

Intentions. A 3 (Group) X 2 (Time) repeated measures ANCOVA on the Intentions Scale total score revealed significant main effects for Group, $F(2,197) = 3.85$, $p = .023$, and Time, $F(1,197) = 6.96$, $p = .009$, but no significant interaction. Regarding group effects, post hoc analyses revealed that the School-Plus-Home and School groups reported significantly more positive intentions than the Control group at the post-intervention assessment. Post hoc analyses of the Time effect revealed that significant increases in intentions were demonstrated from pretest to posttest and from pretest to follow-up.

Again, it should be noted that, assuming improvement, negative effect sizes should be expected for Intentions. Within group effect sizes for the School-Plus-Home group were -.60 (pretest to posttest), .31 (posttest to follow-up) and -.30 (pretest to follow-up). The School group effect sizes were -.60 (pretest to posttest), 0 (posttest to

follow-up), and -.51 (pretest to follow-up). For the Control group, effect sizes were 0 (pretest to posttest), -.07 (posttest to follow-up), and -.07 (pretest to follow-up). Between groups effect sizes were -.30 (School-Plus-Home and School groups), -.43 (School-Plus-Home and Control groups), and -.11 (School and Control groups) at the 2-week post-intervention assessment and -.06 (School-Plus-Home and School groups), -.13 (School-Plus-Home and Control groups), and -.05 (School and Control groups) at the 5-week follow-up assessment.

Behaviors. A 3 (Group) X 2 (Time) repeated measures ANCOVA for MOAS total score showed no significant main or interaction effects. Thus, the three groups did not improve significantly over time and did not differ significantly from each other at any time point or over time for overall behaviors. However, when the MOAS total score was broken down into the 4 protective behaviors, significant effects were found. For self-reported sunscreen use on the MOAS, a 3 (Group) X 2 (Time) repeated measures ANCOVA revealed that there was a significant main effect for Group, $F(2,196) = 4.42$, $p = .013$. Post hoc analyses for the Group effect revealed that the School-Plus-Home and School groups reported significantly more sunscreen use than the Control group at both the post-intervention assessment and the 5-week follow-up assessment.

A 3 (Group) X 2 (Time) repeated measures ANCOVA was also conducted for MOAS shade protection. Analyses revealed a significant Time X Group interaction, $F(2,196)= 3.61$, $p = .029$. Post hoc analyses revealed that the School group demonstrated shade protection increases from the pre-intervention assessment to the follow-up assessment, but the School-Plus-Home group evidenced a significant decrease in shade protection from the post-intervention to the follow-up assessment.

A 3 (Group) X 2 (Time) repeated measures ANCOVA for MOAS long-sleeve shirt protection revealed a significant effect for Time only, $F(1,196) = 8.06$, $p = .005$. Post hoc analyses revealed that long-sleeve shirt use decreased between the post-intervention assessment and follow-up and the pre-intervention assessment and follow-up. No significant effects were found for MOAS hat use.

Positive effect sizes, assuming improvements, are expected for MOAS total score. Within group effect sizes for the School-Plus-Home group were .43 (pretest to posttest), -.31 (posttest to follow-up), and .12 (pretest to follow-up). The School group's effects sizes were .43 (pretest to posttest), .14 (posttest to follow-up), and .28 (pretest to follow-up). For the Control group, effect sizes were .44 (pretest to posttest), -.55 (posttest to follow-up), and .08 (pretest to follow-up). Effect sizes for between groups effects were -.01 (School-Plus-Home and School groups), .09 (School-Plus-Home and Control groups), and .08 (School and Control groups) for the 2-week post-intervention assessment and -.13 (School-Plus-Home and School groups), .33 (School-Plus-Home and Control groups), and .43 (School and Control groups) at the 5-week follow-up assessment.

Effect sizes were also calculated for the four individual sun protective behaviors. Within group effect sizes for sunscreen use for the School-Plus-Home group were .60 (pretest to posttest), -.16 (posttest to follow-up), and .43 (pretest to follow-up). The School group's effect sizes were .81 (pretest to posttest), -.21 (posttest to follow-up), and .59 (pretest to follow-up). For the Control group, effect sizes were .13 (pretest to posttest), -.13 (posttest to follow-up), and -.004 (pretest to follow-up). Effect sizes for between groups effects were .02 (School-Plus-Home and School groups), .43 (School-Plus-Home and Control groups), and .42 (School and Control groups) for the 2-week

post-intervention assessment and .05 (School-Plus-Home and School groups), .41 (School-Plus-Home and Control groups), and .38 (School and Control groups).

Within groups effect sizes for shade use for the School-Plus-Home group were .29 (pretest to posttest), -.18 (posttest to follow-up), and .09 (pretest to follow-up). Effect sizes for the School group were .10 (pretest to posttest), .19 (posttest to follow-up), and .28 (pretest to follow-up). The Control group's effect sizes were .26 (pretest to posttest), -.31 (posttest to follow-up), and -.38 (pretest to follow-up). Between groups effect sizes were .17 (School-Plus-Home and School groups), -.16 (School-Plus-Home and Control groups), and -.33 (School and Control groups) for the 2-week post-intervention assessment and -.20 (School-Plus-Home and School groups), -.01 (School-Plus-Home and Control groups), and .18 (School and Control groups) for the 5-week follow-up assessment.

Shirt use within groups effect sizes for the School-Plus-Home group were -.41 (pretest to posttest), -.04 (posttest to follow-up), and -.44 (pretest to follow-up). Effect sizes for the School group were .11 (pretest to posttest), -.36 (posttest to follow-up), and -.28 (pretest to follow-up). The Control group's effect sizes were .25 (pretest to posttest), -.57 (posttest to follow-up), and -.38 (pretest to follow-up). Between groups effect sizes were .09 (School-Plus-Home and School groups), -.18 (School-Plus-Home and Control groups), and -.25 (School and Control groups) for the 2-week post-intervention assessment and .43 (School-Plus-Home and School groups), .38 (School-Plus-Home and Control groups), and 0 (School and Control groups) for the 5-week follow-up assessment.

Within group effect sizes for hat use for the School-Plus-Home group were .25 (pretest to posttest), -.09 (posttest to follow-up), and .15 (pretest to follow-up). Effect

sizes for the School group were .10 (pretest to posttest), -.09 (posttest to follow-up), and .15 (pretest to follow-up). The Control group's effect sizes were .22 (pretest to posttest), -.22 (posttest to follow-up), and -.01 (pretest to follow-up). Between groups effect sizes were -.25 (School-Plus-Home and School groups), .04 (School-Plus-Home and Control groups), and .30 (School and Control groups) for the 2-week post-intervention assessment and -.25 (School-Plus-Home and School groups), .16 (School-Plus-Home and Control groups), and .41 (School and Control groups) for the 5-week follow-up assessment.

Sun protection recall interview (SPRI). Seventy-three (36%) children were contacted by telephone and completed the SPRI. A relatively equal amount from each of the groups was called (School-Plus-Home: 35%; School: 36%; Control: 37%). Of these, only two, one from the School group and one from the Control group, did not have the opportunity to engage in any outdoor activities the previous day, according to both parent and child. These children were removed from analysis of the SPRI. Means for each of the behaviors of wearing a hat, sitting in the shade, wearing a long-sleeve shirt, and wearing sunscreen can be found in Table 9, broken down by group. These percentages were determined by dividing the time protected (in minutes) by the time exposed (in minutes) for each behavior and for both child and parent report. Effect sizes for between groups effects on the SPRI can be found in Table 10.

Analyses of variance (ANOVA) were conducted to determine if there were differences among the groups with regard to report of sun-protective behaviors through 24-hour recall. Using the child's report, significant between groups effects were found for time protected by sitting in the shade, $F(2, 64) = 4.39$, $p=.016$, use of sunscreen, F(2,

64) = 5.17, p=.008, and overall protection, F (2, 64) = 3.68, p=.031. Post-hoc analyses (Student-Newman-Kuels) indicated that for shade protection, children in the School group (27%) reported significantly less shade protection than the School-Plus-Home group (62%) and the Control group (56%). With regard to sunscreen protection, the School-Plus-Home group differed significantly from the Control group (50% vs. 6%). Similarly, overall percentage of time protected was significantly different between the School-Plus-Home group and the Control group (43% vs. 26%). No significant differences were found among groups using parent recall.

For child report, between groups effect sizes for total SPRI score were .52 (School-Plus-Home and School), .84 (School-Plus-Home and Control), and .30 (School and Control). For sunscreen use, effect sizes were .41 (School-Plus-Home and School), 1.19 (School-Plus-Home and Control), and .62 (School and Control). Effect sizes were .80 (School-Plus-Home and School), .14 (School-Plus-Home and Control), and -.65 (School and Control) for shade use. For shirt use, effect sizes were .04 (School-Plus-Home and School), .26 (School-Plus-Home and Control), and .22 (School and Control). Effect sizes for hat use were -.22 (School-Plus-Home and School), .15 (School-Plus-Home and Control), and .37 (School and Control).

For parent report, between groups effect sizes for total SPRI score were -.10 (School-Plus-Home and School), .12 (School-Plus-Home and Control), and .19 (School and Control). For sunscreen use, effect sizes were -.26 (School-Plus-Home and School), .64 (School-Plus-Home and Control), and .32 (School and Control). Effect sizes were .19 (School-Plus-Home and School), -.43 (School-Plus-Home and Control), and -.66 (School and Control). For shirt use, effect sizes were -.25 (School-Plus-Home and School), .21

(School-Plus-Home and Control), and .38 (School and Control). Effect sizes for hat use were -.54 (School-Plus-Home and School), -.10 (School-Plus-Home and Control), and .43 (School and Control).

Permanent products index. Analysis of the permanent products index can be found in Table 11 and indicates that a greater proportion of children in the School-Plus-Home group took packets of sunscreen (2.99 packets per student vs. 2.86 for the School group and 1.28 for the Control group) and returned empty packets of sunscreen (.87 vs. .28 and .11, respectively). Furthermore, the proportion of packets returned per packets taken per student was significantly greater in the School-Plus-Home group than in either of the other groups (.29 vs. .10 and .09 for the school group and control group, respectively).

Clinical Significance

Kazdin (1992) indicates that statistical evaluation of group differences simply averages the amount of change across all children within a given treatment group. Thus, an intervention may make some children worse but still produce a better overall average change. Furthermore, with effect sizes, the strength of the relationship between the independent variable and the dependent variable does not necessarily show the experience of each subject. Therefore, Kazdin (1992) recommends examining the clinical change values for each client to determine which intervention produces improvements in the largest proportion of children and subsequently maximizes the possibility that a given subject will be favorably affected by the intervention.

No other study in the area of sun protection has used a measure of clinical change to demonstrate the effectiveness of an intervention. Thus, it was determined that the

criterion for clinical improvement would be a one or more standard deviation improvement from pre-test to post-test for those who were below the mean at pre-test. After the overall pre-test means for each measure were established, children who scored below the mean on the pre-test measures were evaluated to determine if their performance improved significantly following the intervention. Table 12 demonstrates the findings of these analyses. For knowledge, 84% of the children in the School-Plus-Home group who scored below the mean at pre-test improved by one standard deviation or more at post-test. The percentage improving in knowledge for the School and Control groups were 86 and 23 percent, respectively. With regard to attitudes and beliefs, the percentage of children in the School-Plus-Home group, School group, and Control group with clinical improvement from pre-test to post-test was 33%, 28%, and 10%, respectively. For intentions, the percentages were 31%, 38%, and 13% (School-Plus-Home, School, and Control, respectively). Clinically significant improvements in overall self-reported protective behaviors were 47% (School-Plus-Home), 38% (School), and 11% (Control).

Regression Analyses (Hypothesis 4)

Combining the three groups, six hierarchical multiple regression analyses were conducted to examine the contributions of demographic variables, sun protection variables, exposure to an intervention, sun exposure attitudes and beliefs, and intentions on several dependent variables. These six dependent variables were pre-intervention intentions (total score; as measured by the Intentions Scale), post-intervention intentions (total score; as measured by the Intentions Scale), post-intervention sunscreen use (as measured by the MOAS), post-intervention shade use (as measured by the MOAS), post-

intervention long-sleeve shirt use (as measured by the MOAS), and post-intervention hat use (as measured by the MOAS). Variables were entered hierarchically in the order mentioned above. All demographic variables and sun protection variables (as shown in Tables 2-5 were entered into the regression analyses. Both demographic variables and sun protection variables were entered in blocks; however, there was no a priori determination of order of variables within the blocks. If variables in the earlier steps were non-significant, they were dropped from the model prior to going to the next step in order to maximize the degrees of freedom and the ability to detect an effect.

The overall regression analysis for pre-intervention intentions was statistically significant, $F(4, 187) = 27.2$, $p = .001$. This regression analysis is summarized in Table 13. As indicated, 37% of the variance in pre-intervention intentions is accounted for by these 4 variables. Specifically, 6% is accounted for by gender, 27% by attitudes and beliefs, 2% by MOAS sunscreen use, and 2% by MOAS shade use. Being a girl, having more positive attitudes and beliefs, having engaged in sunscreen use in the past week, and having stayed in the shade in the past week were significant predictors of intention to engage in sun protective behaviors prior to the intervention ($p < .001$).

The overall regression analysis for post-intervention intentions was significant, $F(4,190) = 61.1$, $p = .001$. This regression analysis is summarized in Table 14. As indicated, 57% of the variance in post-intervention intentions is accounted for by these 4 variables. Specifically, 45% is accounted for by pre-intervention intentions, 2% by the interaction between pre-intervention intentions and having received the School-Plus-Home intervention, 7% by post-intervention attitudes and beliefs, and 3% by post-intervention MOAS sunscreen use. Having high intentions, receiving the School-Plus-

Home intervention, having more positive attitudes and beliefs post-intervention, and having engaged in sunscreen use in the past week after the intervention were predictive of intentions to engage in sun protective behaviors after the intervention ($p < .001$).

Regression analyses were also conducted for the four protective behaviors as measured by the MOAS. The overall regression analysis for post-intervention sunscreen use was statistically significant, $F(3,179)$, $p = .001$, accounting for 25% of the variance in post-intervention sunscreen use. This regression analysis is summarized in Table 15. As indicated, 9% of the variance is accounted for by gender, 11% by pre-intervention sunscreen use, and 5% by post-intervention intentions. Being a girl, having higher pre-intervention sunscreen use, and greater intentions to engage in sun protective behaviors following the intervention were significant predictors of self-report of engaging in sunscreen use following the intervention ($p < .01$).

The overall regression analysis for shade use was significant, $F(2,191) = 16.1$, $p = .001$, accounting for 15% of the variance in post-intervention shade use. This regression analysis is summarized in Table 16. As indicated, 10% of the variance is accounted for by pre-intervention shade use and 5% by post-intervention long-sleeve shirt use. Higher shade use pre-intervention and higher shirt use post-intervention were significant predictors of post-intervention shade use ($p < .001$).

The overall regression analysis for post-intervention long-sleeve shirt use was significant, $F(3,172) = 10.7$, $p = .001$, accounting for 16% of the variance in long-sleeve shirt use. This regression analysis is summarized in Table 17. As indicated, 4% of the variance is accounted for by parent age, 4% by pre-intervention sunscreen use, and 8% by post-intervention shade use. Having younger parents, having engaged in sunscreen use

pre-intervention, and shade use post-intervention were significant predictors of post-intervention long-sleeve shirt use ($p < .001$).

The overall regression analysis for post-intervention hat use was significant, $F(5,177) = 16.7$, $p = .001$, accounting for 33% of the variance in post-intervention hat use. This regression analysis is summarized in Table 18. As indicated, 12% of the variance is accounted for by gender, 3% by pre-intervention shirt use, 13% by pre-intervention hat use, and 5% by having received the school intervention. Being a boy, having higher pre-intervention shirt use and hat use, and having received the School intervention were significant predictors of post-intervention hat use ($p < .001$). The correlations among the predictor and dependent variables for these regression analyses are presented in Table 19.

Secondary Analyses

Validity Issues

Correlations among various aspects of the SPRI (both child and parent report), as well as among the SPRI and the MOAS are presented in Table 17. There is a high significant positive correlation ($r=.72$, $p<.01$) between the percentage of time protected reported by the children in the School-Plus-Home group on the post-test MOAS and the percentage reported on the SPRI. The correlation for all groups combined was also significant ($r=.37$, $p<.01$), lending some concurrent validity to these measures of self-report.

Parent-Child Agreement

The parent-child correlations for the SPRI total were significant for all groups except the School-Plus-Home group (School group=.44; Control group=.78; All

groups=.46, all p's < .05). Relatedly, children in the School-Plus-Home group reported a higher percentage of protective behaviors than their parents reported for their children (M = 43% vs. 27%, respectively).

Table 2
Demographic Characteristics of the Subject Sample-Frequencies (%)

	CONTROL			SCHOOL				SCHOOL+HOME			
	Bronson (n=21)	Southside (n=33)	Total (n=54)	Cedar Key (n=19)	Williston (n=22)	McRae (n=37)	Total (n=78)	Chiefland (n=33)	Brooker (n=22)	Hampton (n=16)	Total (n=71)
Participation Rate	40	69	53	72	79	54	64	75	76	83	74
Race											
White	85	82	84	95	81	100	93	88	91	94	90
Black	10	18	14	0	19	0	6	3	9	6	6
Hispanic/Latino	5	0	2	0	0	0	0	6	0	0	3
Asian	0	0	0	0	0	0	0	3	0	0	1
Other	0	0	0	5	0	0	1	0	0	0	0
Gender											
Male	38	57	48	42	54	50	49	37	33	56	40
Female	62	43	52	58	46	50	51	63	67	44	60
# Parents in Home											
1	30	26	28	6	33	22	20	18	24	20	20
2	70	74	72	94	67	78	80	82	76	80	80
Social Strata											
1	6	0	3	0	0	0	0	0	0	0	0
2	6	19	13	17	8	27	20	32	7	25	23
3	50	25	37	58	33	39	42	28	43	13	30
4	25	31	28	17	59	34	36	24	43	62	36
5	13	25	19	8	0	0	2	16	7	0	11

Note: Social Strata is based on the Hollingshead (1975) 4-Factor Index of Social Status. One is the lowest status and 5 is the highest.

Table 3
Demographic Characteristics of the Subject Sample-Descriptives

	CONTROL			SCHOOL				SCHOOL+HOME			
	Bronson (n=21)	Southside (n=33)	Total (n=54)	Cedar Key (n=19)	Williston (n=22)	McRae (n=37)	Total (n=78)	Chiefland (n=33)	Brooker (n=22)	Hampton (n=16)	Total (n=71)
Child Age											
Range	10-12	10-12	10-12	10-12	10-12	10-13	10-13	10-12	10-11	10-11	10-12
Mean	10.9	10.7	10.8	10.9	10.6	10.9	10.8	10.8	10.8	10.7	10.7
SD	.5	.6	.6	.5	.5	.6	.6	.5	.4	.4	.5
Parent Age											
Range	28-44	30-58	28-58	25-60	29-44	28-45	25-60	30-50	27-51	28-46	27-51
Mean	35.1	37.4	36.3	40.5	34.3	35.9	36.7	37.4	38.1	34.3	36.9
SD	4.6	6.3	5.7	10.4	4.3	4.7	7.0	5.1	7.1	4.5	5.8
Parent Education											
Range	8-14	9-20	8-20	10-16	11-18	8-16	8-18	8-20	11-17	10-14	8-17
Mean	12.3	13.9	13.1	12.7	12.6	12.0	12.3	12.8	12.8	12.2	12.7
SD	1.3	3.0	2.5	2.0	1.7	1.7	1.8	3.0	1.5	1.2	2.4
Spouse Educ.											
Range	9-20	11-18	9-20	6-20	12-14	10-16	6-20	6-20	9-18	12-14	6-20
Mean	12.6	13.9	13.2	12.1	12.3	12.0	12.1	12.5	12.9	12.3	12.6
SD	2.6	2.2	2.5	2.8	.6	1.3	1.8	3.1	2.5	.6	2.7
SES											
Range	18-61	22-66	18-66	22-57	30-52	24-52	22-57	22-60	20-56	22-53	20-60
Mean	38.7	43.4	41.1	35.8	40.2	36.3	37.1	38.3	40.7	40.0	39.3
SD	11.8	13.0	12.5	8.7	6.6	7.9	7.9	11.8	9.6	11.7	11.1

Note: SES is based on the Hollingshead (1975) 4-Factor Index of Social Status, with a lower number indicating lower social status. Possible range is 8-66.

Table 4
Sun Protection-Related Characteristics of the Subject Sample-Descriptives

	CONTROL			SCHOOL				SCHOOL+HOME			
	Bronson (n=21)	Southside (n=33)	Total (n=54)	Cedar Key (n=19)	Williston (n=22)	McRae (n=37)	Total (n=78)	Chiefland (n=33)	Brooker (n=22)	Hampton (n=16)	Total (n=71)
Child Burns											
Range	0-6	0-9	0-9	0-8	0-3	0-20	0-20	0-5	0-8	0-5	0-8
Mean	1.5	1.4	1.5	1.7	1.1	1.8	1.6	.9	2.1	1.6	1.4
SD	1.8	2.3	2.1	1.7	1.2	3.6	2.8	1.1	2.5	2.1	1.9
Parent Burns											
Range	0-10	0-12	0-12	0-20	0-10	0-60	0-60	0-20	0-25	0-10	0-25
Mean	4.1	2.7	3.3	4.8	3.3	5.7	4.8	3.5	4.6	2.8	3.7
SD	3.4	3.2	3.4	4.8	3.4	12.0	8.7	4.6	7.4	4.4	5.6
Visits to Beach											
Range	0-10	0-20	0-20	0-50	0-30	0-50	0-50	0-20	0-8	0-20	0-20
Mean	2.3	4.8	3.5[b]	12.1	4.5	5.9	7.0[a]	2.4	2.5	3.0	2.6[b]
SD	2.3	5.6	4.4	12.6	6.6	10.0	10.3	3.8	2.4	5.2	3.8
Hours at Beach											
Range	0-8	0-8	0-8	1-6	0-12	1-16	0-16	0-15	0-8	0-16	0-16
Mean	3.9	4.1	4.0	2.5	4.8	3.8	3.7	4.0	4.3	3.4	3.9
SD	2.5	2.3	2.4	1.4	2.8	2.9	2.6	4.1	2.6	4.2	3.7
Age Child Resp.											
Range	7-18	6-16	6-18	8-18	5-25	1-35	1-35	1-18	6-30	5-30	1-30
Mean	13.3	12.8	13.0	13.6	12.8	13.3	13.3	12.6	13.8	13.3	13.1
SD	4.0	3.1	3.6	2.6	5.3	5.4	4.8	4.4	5.0	6.4	5.0

Note: Means with different superscripts in rows differ significantly at $p < .05$.

Table 4-Continued

Key: Child Burns = How many painful (e.g., blistering, etc.) sunburns (lifetime) has your child had?
Parent Burns = How many painful (e.g., blistering, etc.) sunburns (lifetime) have you had?
Visits to Beach = Number of beach visits in the past year
Hours at Beach = Average length at beach (hours) for visits in the past year
Age Child Resp. = At what age do/would you give your child responsibility for protecting themselves from the sun?

Table 5
Sun Protection Related Data-Frequencies (%)

	CONTROL			SCHOOL				SCHOOL+HOME			
	Bronson (n=21)	Southside (n=33)	Total (n=54)	Cedar Key (n=19)	Williston (n=22)	McRae (n=37)	Total (n=78)	Chiefland (n=33)	Brooker (n=22)	Hampton (n=16)	Total (n=71)
Child Skin Type											
1	13	15	14	13	8	6	8	8	11	0	7
2	19	20	19	6	0	9	6	15	16	18	16
3	19	35	28	63	62	42	52	42	42	55	45
4	50	30	39	19	31	43	34	35	32	27	32
Parent Skin Type											
1	6	11	8	22	8	18	17	18	7	0	11
2	13	5	9	6	25	21	17	21	33	25	25
3	56	42	49	50	50	24	37	32	33	67	40
4	25	42	34	22	17	36	29	29	27	8	24
Family Hx											
Yes	26	39	33	47	33	43	42	39	38	40	39
No	74	61	67	53	67	57	58	61	62	60	61
Info from Ped.											
Yes	30	19	24[a]	0	10	11	8[b]	9	9	15	11[b]
No	70	81	76	100	90	89	92	91	91	85	89
Tan Healthy											
Yes	32	40	36	16	47	35	33	22	33	36	28
No	68	60	64	84	53	65	67	78	67	64	72
Sunscreen at Home											
Yes	84	83	83	100	76	97	92	85	95	93	90
No	16	17	17	0	24	3	8	15	5	7	10

Note: Percentages with different superscripts in rows differ significantly at $p < .05$.

Table 5-Continued

Key: Child and Parent Skin Type = Which of the following best describes you/your child's reaction to your/your child's first exposure to summer sun for one hour at midday?

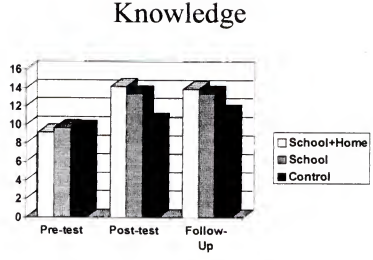
A painful burn the next day and no tan one week later (Type 1)
A painful burn the next day and a light tan one week later (Type 2)
A slightly tender burn the next day and a moderate tan one week later (Type 3)
No burn the next day and a good tan one week later (Type 4)

Family Hx. = Do you know of any family members who have/had skin cancer?
Info. From Ped. = Has your child's pediatrician given you information concerning skin cancer or sun protection in the last 12 months?
Tan Healthy = I think a suntan enhances my child's appearance.
Sunscreen at Home = Do you have sunscreen at home?

Table 6
Means, Standard Deviations, and Significant Effects for Knowledge, Attitudes and Beliefs, Intentions, and Behaviors

Measure	Pre-test			Post-Test			Follow-Up			Sign. Effects
	S+H	S	C	S+H	S	C	S+H	S	C	
Knowledge										G, G x T
Mean	9.2	9.7	9.6	14.2	13.4	10.4	13.9	13.4	11.3	
SD	2.8	2.9	2.9	2.2	2.3	2.7	2.4	2.2	2.5	
Range	3-15	0-16	3-15	7-17	7-17	4-16	4-17	7-17	5-15	
Attitudes[1]										G
Mean	42.0	43.1	40.2	40.4	42.9	42.7	41.2	43.5	43.5	
SD	7.0	8.5	8.6	8.7	10.9	8.6	7.2	10.3	9.2	
Range	27-63	24-63	24-64	22-63	22-73	25-59	26-63	24-76	27-68	
Intentions[1]										T, G
Mean	14.0	15.8	13.7	11.4	13.0	13.7	12.7	13.0	13.3	
SD	4.5	5.4	6.1	4.2	6.6	6.5	4.2	5.7	5.3	
Range	6-24	6-29	6-30	6-23	6-30	6-30	6-24	6-30	6-28	
Behaviors										
Total										None
Mean	23.9	23.3	22.3	29.9	30.0	28.6	25.5	27.5	21.4	
SD	13.3	13.0	11.2	14.8	18.0	15.6	13.7	17.2	11.5	
Range	0-55	0-65	0-50	0-78	0-75	0-75	0-63	0-75	0-50	
Sunscreen										G
Mean	10.5	7.7	10.8	26.8	26.1	13.9	21.7	20.1	10.7	
SD	21.7	14.9	17.9	32.5	30.5	28.2	31.0	27.2	22.7	
Range	0-100	0-67	0-80	0-100	0-100	0-100	0-100	0-100	0-100	
Shade										G x T
Mean	34.5	34.9	40.0	43.2	37.8	48.6	37.2	43.9	37.7	
SD	26.9	29.1	31.2	33.6	29.4	35.5	31.9	34.4	35.3	
Range	0-100	0-100	0-100	0-100	0-100	0-100	0-100	0-100	0-100	
Shirt										T
Mean	21.0	6.3	8.8	10.1	8.3	14.2	9.2	2.9	2.9	
SD	33.9	14.6	17.0	18.9	20.6	25.7	19.2	9.8	13.7	
Range	0-100	0-90	0-80	0-90	0-90	0-100	0-100	0-50	0-80	
Hat										None
Mean	28.9	43.4	29.4	37.7	47.0	36.4	34.4	43.7	29.1	
SD	34.0	34.1	30.0	36.2	37.1	34.5	36.6	38.9	31.5	
Range	0-100	0-100	0-100	0-100	0-100	0-100	0-100	0-100	0-100	

[1] Lower scores indicate more positive attitudes and beliefs and higher intentions.



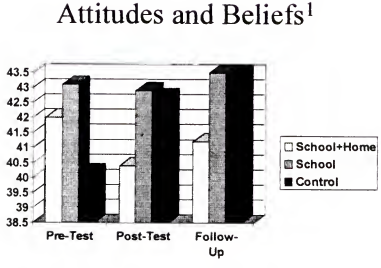
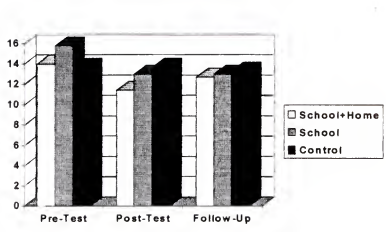


Figure 2
Means of Dependent Variables Across Time and Group
[1] Lower scores indicate healthier attitudes and beliefs.



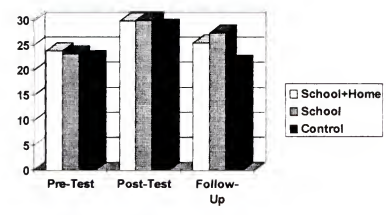


Figure 2-Continued

[1] Lower scores indicate greater intentions to engage in protective behaviors

Table 7
Effect Sizes-Within Groups

GROUP 1-SCHOOL + HOME

	PRE-POST	POST-F/U	PRE-F/U
KNOWLEDGE	2.00	.13	1.80
ATTITUDES	-.20	.10	-.11
INTENTIONS	-.60	.31	-.30
BEHAVIORS	.43	-.31	.12
SUNSCREEN	.60	-.16	.43
SHADE	.29	-.18	.09
SHIRT	-.41	-.04	-.44
HAT	.25	-.09	.15

GROUP 2-SCHOOL

	PRE-POST	POST-F/U	PRE-F/U
KNOWLEDGE	1.42	0	1.50
ATTITUDES	-.02	-.06	-.11
INTENTIONS	-.60	0	-.51
BEHAVIORS	.43	.14	.28
SUNSCREEN	.81	-.21	.59
SHADE	.10	.19	.28
SHIRT	.11	-.36	-.28
HAT	.10	-.09	.15

GROUP 3-CONTROL

	PRE-POST	POST-F/U	PRE-F/U
KNOWLEDGE	.29	.35	.63
ATTITUDES	.29	.09	.37
INTENTIONS	0	-.07	-.07
BEHAVIORS	.44	-.55	.08
SUNSCREEN	.13	-.13	-.004
SHADE	.26	-.31	-.38
SHIRT	.25	-.57	-.38
HAT	.22	-.22	-.01

Table 8
Between Groups Effect Sizes (2-Week Post-Test and 5-Week Follow-Up)

	SCHOOL+HOME VS. SCHOOL		SCHOOL+HOME VS. CONTROL		SCHOOL VS. CONTROL	
	Post-Test	Follow-Up	Post-Test	Follow-Up	Post-Test	Follow-Up
KNOWLEDGE	.36	.22	1.55	1.06	1.2	.89
ATTITUDES	-.25	-.26	-.26	-.28	.02	0
INTENTIONS	-.30	-.06	-.43	-.13	-.11	-.05
BEHAVIORS	-.01	-.13	.09	.33	.08	.43
SUNSCREEN	.02	.05	.43	.41	.42	.38
SHADE	.17	-.20	-.16	-.01	-.33	.18
SHIRT	.09	.43	-.18	.38	-.25	0
HAT	-.25	-.25	.04	.16	.30	.41

Table 9
Means and Standard Deviations for Sun Protection Recall Interview

	School + Home		School		Control		Total	
Child	(n=23) Mean	SD	(n=27) Mean	SD	(n=17) Mean	SD	(n=67) Mean	SD
Hat	36.3	45.3	46.7	47.7	29.4	46.9	38.8	46.5
Shade	62.1[b]	45.6	27.3[a]	41.3	55.8[b]	46.1	46.5	46.2
Shirt	21.4	39.6	20.0	39.1	12.4	29.1	18.5	36.7
Sunscreen	50.0[b]	50.0	30.7	45.3	5.9[a]	24.3	31.0	45.5
Total	42.5[b]	23.4	31.2	19.6	25.9[a]	15.9	33.7	21.0
Parent	(n=18) Mean	SD	(n=23) Mean	SD	(n=15) Mean	SD	(n=56) Mean	SD
Hat	22.2	42.8	47.0	49.4	26.7	45.8	33.6	46.9
Shade	47.4	49.4	38.4	45.2	67.0	41.6	48.9	46.3
Shirt[1]	5.8	24.3	13.0	34.4	0.0	0.0	7.3	26.2
Sunscreen	29.6	45.6	18.7	37.2	6.7	25.8	19.0	38.0
Total	27.2	23.2	29.3	17.4	25.1	10.5	27.5	17.9

Note: Means with different superscripts in rows differ significantly at $p < .05$.
[1] The zeros for the mean and standard deviation for the Control group indicate that no long-sleeve shirt use was reported for these children by their parents.

Table 10
Between Groups Effect Sizes for the Sun Protection Recall Interview

	SCHOOL+HOME VS. SCHOOL	SCHOOL+HOME VS. CONTROL	SCHOOL VS. CONTROL
Child			
Total	.52	.84	.30
Sunscreen	.41	1.19	.62
Shade	.80	.14	-.65
Shirt	.04	.26	.22
Hat	-.22	.15	.37
Parent			
Total	-.10	.12	.19
Sunscreen	-.26	.64	.32
Shade	.19	-.43	-.66
Shirt	-.25	.21	.38
Hat	-.54	-.10	.43

Table 11
Permanent Products Index-Proportions

	Packets taken/ student	Packets returned/ student	Packets returned/ packets taken
SCHOOL+HOME	2.99	.87	.29
SCHOOL	2.86	.28	.10
CONTROL	1.28	.11	.09

Table 12
Post-Test Performance of Children Scoring Below the Mean at Pre-Test- (% of children)

Knowledge

	School+Home (56%)[a]	School (44%)	Control (48%)
1-2 SD Improved	23	49	15
2-3 SD Improved	45	31	4
3-4 SD Improved	13	3	4
> 4 SD Improved	3	3	0
Total Clinically Improved	84	86	23
Increase Not Significant	13	11	73
Decrease Not Significant	3	3	4
1-2 SD Declined	0	0	0
2-3 SD Declined	0	0	0
Total Clinically Declined	0	0	0

Attitudes

	School+Home (48%)	School (58%)	Control (39%)
1-2 SD Improved	21	24	10
2-3 SD Improved	12	4	0
3-4 SD Improved	0	0	0
> 4 SD Improved	0	0	0
Total Clinically Improved	33	28	10
Increase Not Significant	32	34	28
Decrease Not Significant	29	18	52
1-2 SD Declined	6	18	10
2-3 SD Declined	0	2	0
Total Clinically Declined	6	20	10

[a] Number in parentheses indicates percentage of children scoring below the mean at pre-test in each group.

Table 12-Continued

Intentions

	School+Home (41%)	School (55%)	Control (43%)
1-2 SD Improved	21	31	9
2-3 SD Improved	10	5	4
3-4 SD Improved	0	2	0
> 4 SD Improved	0	0	0
Total Clinically Improved	31	38	13
Increase Not Significant	66	40	52
Decrease Not Significant	3	17	22
1-2 SD Declined	0	5	13
2-3 SD Declined	0	0	0
Total Clinically Declined	0	5	13

Behaviors

	School+Home (50%)	School (49%)	Control (51%)
1-2 SD Improved	36	21	7
2-3 SD Improved	11	11	4
3-4 SD Improved	0	3	0
> 4 SD Improved	0	3	0
Total Clinically Improved	47	38	11
Increase Not Significant	47	35	74
Decrease Not Significant	3	24	11
1-2 SD Declined	3	3	4
2-3 SD Declined	0	0	0
Total Clinically Declined	3	3	4

[a] Number in parentheses indicates percentage of children scoring below the mean at pre-test in each group.

Table 13
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behaviors, and Attitudes and Beliefs in Predicting Pre-Intervention Intentions

Predictor Variable	B	Cumulative R^2	P Value
Gender	-.122	.06	.044
Attitudes and Beliefs	.494	.33	.001
MOAS			
Sunscreen Use	-.140	.35	.022
Shade	-.172	.37	.005

Note: Gender was coded as 1 for male and 2 for female

Table 14
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behaviors, and Attitudes and Beliefs in Predicting Post-Intervention Intentions

Predictor Variable	Beta Weight	Cumulative R^2	p value
Pre-Intervention			
Intentions	.476	.45	.001
Intervention			
Intentions x Intervention	-.111	.47	.023
Post-Intervention			
Attitudes and Beliefs	.320	.54	.001
MOAS			
Sunscreen Use	-.162	.57	.001

Table 15
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behavior, Attitudes and Beliefs, and Intentions in Predicting Post-Intervention Sunscreen Use Behaviors

Predictor Variable	Beta Weight	Cumulative R^2	p value
Gender	.195	.09	.005
Pre-Intervention			
MOAS			
Sunscreen Use	.286	.20	.001
Post-Intervention			
Intentions	-.226	.25	.001

Table 16
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behavior, Attitudes and Beliefs, and Intentions in Predicting Post-Intervention Shade Use Behaviors

Predictor Variable	Beta Weight	Cumulative R^2	p value
Pre-Intervention			
MOAS			
Shade Use	.278	.10	.001
Post-Intervention			
MOAS			
Long-Sleeve Shirt Use	.224	.15	.001

Table 17
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behavior, Attitudes and Beliefs, and Intentions in Predicting Post-Intervention Long-Sleeve Shirt Use Behaviors

Predictor Variable	Beta Weight	Cumulative R^2	p value
Parent Age	-.213	.04	.003
Pre-Intervention			
MOAS			
Sunscreen Use	.211	.08	.004
Post-Intervention			
MOAS			
Shade Use	.280	.16	.001

Table 18
Hierarchical Multiple Regression Analysis Evaluating the Contribution of Demographic Variables, Sun Protection Variables, Sun Protection Knowledge, Behavior, Attitudes and Beliefs, and Intentions in Predicting Post-Intervention Hat Use Behaviors

Predictor Variable	Beta Weight	Cumulative R^2	p value
Gender	-.201	.12	.005
Pre-Intervention			
MOAS			
Shirt Use	.244	.15	.001
Hat Use	.367	.28	.001
Intervention			
School	.532	.33	.001

Table 19

Correlations Among Predictor and Dependent Variables of the Conceptual Model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	--	.03	-.14	.15*	.17*	-.36**	-.23**	-.06	.02	-.21**	-.24**	.30**	.07	.11	-.35**
2		--	-.04	.12	.05	.06	-.01	.00	.02	-.08	.04	-.07	-.07	-.20**	.00
3			--	-.20**	-.10	.00	.55**	.12	.11	.58**	.37**	-.08	-.06	.00	.04
4				--	-.10	.04	-.22**	-.08	.02	-.20**	-.24**	.38**	-.03	.17*	.04
5					--	-.08	-.23**	-.03	-.08	-.13	-.15*	-.02	.31**	.15*	.05
6						--	.08	.21**	-.11	.04	-.02	-.02	-.08	-.10	.45**
7							--	.17*	.10	.49**	.65**	-.25**	-.09	-.16*	-.00
8								--	-.54**	.08	.05	.07	-.12	-.08	.13
9									--	-.02	-.07	.03	.02	-.04	-.02
10										--	.57**	-.15*	-.13	-.05	.03
11											--	-.33**	-.14*	-.18*	-.05
12												--	.03	.10	.03
13													--	.27**	-.02
14														--	.05
15															--

Key:
1-Child Gender
2-Parent Age
3-Pre-Intervention Attitudes and Beliefs
4-Pre-Intervention MOAS Sunscreen Use
5-Pre-Intervention MOAS Shade Use
6-Pre-Intervention MOAS Hat Use
7-Pre-Intervention Intentions
8-School Intervention
9-Pre-Intervention Intentions X School-Plus-Home Intervention
10-Post-Intervention Attitudes and Beliefs
11-Post-Intervention Intentions
12-Post-Intervention MOAS Sunscreen Use
13-Post-Intervention MOAS Shade Use
14-Post-Intervention MOAS Long-Sleeve Shirt Use
15-Post-Intervention MOAS Hat Use

Table 20
Sun Protection Recall Interview-Correlations

Correlation	School + Home	School	Control	Total
CHAT x PHAT	.56**	.77**	.84**	.72**
CHAT x CXTIMEPRO	.53*	.52*	.71**	.54**
CHAT x PXTIMEPRO	.15	.29	.61*	.28*
CHAT x T2MOASHAT	.81**	.33	.50	.49**
CHAT x T2MOASHIRT	.32	-.36	.58**	-.01
CSHIRT x PSHIRT	-.10	.70**	---	.46**
CSHIRT x PSHADE	.14	.48*	.13	.27
CSHIRT x CXTIMEPRO	.69**	.45*	.60**	.53**
CSHIRT x T2MOASHAT	.31	.37	.29	.36*
CSHIRT x T2MOASHIRT	-.01	.40	.73**	.40*
CSHIRT x T2MOASTOT	.32	.42*	.19	.35*
CSHADE x PSHADE	.38	.44*	.65*	.46**
CSHADE x T2MOASHAT	.39	.44*	-.42	.11
CSHADE x T2MOASHADE	.71**	.33	-.18	.36*
CSHADE x T2MOASTOT	.64**	.30	-.24	.22
CSCREEN x PSHADE	-.21	-.52*	-.44	-.41*
CSCREEN x PSCREEN	.87**	.58**	1.00**	.75**
CSCREEN x T2MOASCREEN	.68**	.56**	.41	.57**
CXTIMEPRO x PHAT	.10	.48*	.52	.31*
CXTIMEPRO x PSCREEN	.53*	.15	.06	.35*
CXTIMEPRO x PXTIMEPRO	.41	.44*	.78**	.46**
CXTIMEPRO x T2MOASHAT	.53*	.61**	.05	.42**
CXTIMEPRO x T2MOASHIR	.22	.06	.75**	.18
CXTIMEPRO x T2MOASTOT	.72**	.38	-.10	.37**
PHAT x TSMOASHAT	.27	.39	.40	.38**
PHAT x T2MOASCREEN	-.07	-.34	-.38	-.28*
PSHIRT x T2MOASCREEN	.31	.39	---	.29*
PSHADE x T2MOASCREEN	.13	-.42*	-.49	-.25
PSCREEN x T2MOASCREEN	.72**	.26	.41	.49**
PXTIMEPRO x T2MOASCREEN	.52*	-.18	-.59*	.06
T2MOASHAT x T2MOASHIRT	.30	.14	.22	.18
T2MOASHIRT x T2MOASHADE	.08	.59**	.10	.30*

Note: All variables prefixed with a C are from child report, those with a P from parent report.
T2MOAS indicates child's self-report of sun protective behaviors at the 2-week posttest.
CXTIMEPRO= SPRI Total proportion of time protected reported by the child
PXTIMEPRO= SPRI Total proportion of time protected reported by the parent

DISCUSSION

This study evaluated a school-based intervention to promote sun protection knowledge, attitudes and beliefs, intentions, and behaviors that included parents (School-Plus-Home). This intervention was compared to a School intervention with demonstrated effectiveness and a no-intervention Control group. It also tested a conceptual model for predicting sun protection intentions and behaviors. Several studies have been conducted in the area of promotion of sun protection behaviors within the school setting. However, none of these have attempted to evaluate the family contribution to assisting with change in sun protection knowledge, attitudes and beliefs, intentions, and behaviors and maintenance of these factors. A pretest-posttest control group design with follow-up was employed in this study. Knowledge, attitudes and beliefs, intentions, and behaviors were examined using questionnaires adapted from the literature. Furthermore, recall interviews and a behavioral permanent products index were used to corroborate self-report behavioral information.

Demographic and Sun Protection-Related Variables

A large percentage of parents and children in this study knew of someone in their family who had a history of skin cancer. This percentage was found to be similar (39%) in a previous study (Lescano and Rodrigue, 1997). These rates are fairly high and suggest evidence for current trends in skin cancer incidence rates. However, results regarding whether this factor is associated with sun protection knowledge, attitudes and

beliefs, and behaviors have been inconsistent with some finding a relationship (Keesling & Friedman, 1987) and others finding no relationship (Banks et al., 1992; Lescano & Rodrigue, 1997). For the current study, there was a relationship between this factor and sun protection knowledge, with those who have a familial history of skin cancer obtaining higher scores at the pre-test. However, no effects were obtained for sunscreen use as they had been in the Keesling and Friedman (1987) study. Furthermore, this factor may be more difficult to associate with children's knowledge, attitude and beliefs, intentions, and behaviors because they might not be aware that there is a history of skin cancer within their family.

A surprisingly small amount of parents in this sample reported having received skin cancer or sun protection information from their child's pediatrician in the last 12 months. However, it is not known whether this is associated with parents' forgetting that the pediatrician had mentioned it or whether no information was provided. Furthermore, it should be recognized that this study only included prior education from pediatricians although parents may receive information from many other sources, including television, radio, newspapers, and other physicians. These numbers are comparable to a previous study that found that only 25 percent of parents reported having received sun exposure information from their pediatrician (Lescano & Rodrigue, 1997). Mixed messages concerning the importance of skin care and sun protection may be perceived by those who do not feel that their physician includes these topics as essential aspects of primary care. An important question to ask in future studies may be the nature and extent of the pediatrician's education efforts. Parents who simply receive a pamphlet may have different knowledge levels, attitudes and beliefs, intentions, and behaviors than those who

receive a pamphlet with discussion and sunscreen samples from their pediatrician. It would also be important to ask if their children were actively involved in the pediatrician's education efforts.

The number of children and parents who have had more than one severe sunburn is alarming given that the risk of developing malignant melanoma is doubled if a person has had one or more severe sunburns in childhood (Banks et al., 1992). For these persons, secondary prevention efforts, such as skin self-examination, would also be of benefit to ensure that the damage they have already incurred does not lead to melanoma.

Almost one third of the parents in this study hold the attitude that a tan looks healthy on their children. This attitude alone can be very detrimental to efforts to include parents in sun protection projects. However, this attitude appears to be less pervasive in this study than in other studies and could reflect changing social norms, the constitution of the subject sample, or some combination of the two. For example, Lescano and Rodrigue (1997) found that 46 percent of children held the attitude that a tan enhances their child's appearance while Madudoc et al. (1992) found that 82 percent of parents held the attitude that a tan looked healthy on their child. Additionally, 40 percent of parents in a Grob et al. (1993) study exposed their child to the sun for health reasons (i.e., increased Vitamin D levels). These attitudes and beliefs are difficult to change given that they are perpetuated through advertising and even some health professionals who argue that the sun does have some health benefits.

While children in this study may have the opportunity to frequent the beach more often than other children around the country due to their proximity to the ocean, this study also focused on other exposure behaviors. This examination of broad sun

protective behaviors is imperative for the generalizability of the study and is important because children spend a large amount of time outdoors both during school (e.g., recess, lunch, PE) and at home (e.g., sporting activities, swimming, bike riding).

Parents in this study and in another study (Lescano & Rodrigue, 1997) reportd that they would allow their children more responsibility for their own sun protection at the average age of 13. This may suggest that intervention efforts may be more effective for children who are older (i.e., 13 year old, 8th grade students) but whose parents may still maintain some responsibility for their child's protection. It is possible that 10 year old, fifth-graders are too young to feel responsible, particularly when their parents may not be affording them the responsibility.

Most children in this study had sunscreen available to them at home, which eliminates the barrier, at least for most children, of not having access to sunscreen. However, parents often control access to sunscreen. Thus, it was not known whether the children in this study had unlimited access to the sunscreen in their home. Additionally, some families may display the sunscreen in their homes (in mustard jars, etc.) as cues to action while others may have the sunscreen in a beach bag in the back of a closet. Further issues include whether what is available to them at home is sunscreen as opposed to suntanning lotion and whether the SPF of the sunscreen is at least the minimum (15) recommended by the ACS.

Analyses of demographic and sun protection-related variables indicated that, for the most part, children in each group were equivalent on the above-mentioned variables. This was necessary to ensure that no factors, other than the reception of an intervention, accounted for post-test changes and maintenance of changes among these groups.

Knowledge

Receiving the School-Plus-Home intervention was most effective in increasing skin cancer and sun protection knowledge and in maintenance of these effects. The School-Plus-Home intervention produced more substantial knowledge gains than the School intervention in that significantly more questions were answered correctly following the intervention. It is possible that the extra time spent with parents at home learning the new concepts, and with more opportunity for discussion, may have facilitated these extra knowledge gains. Many children in the Control group improved significantly, which may be due to information attained after the pre-test from parents or other sources such as television, newspapers, and radio that were beyond the control of the investigators.

The findings herein provide evidence for replication of results of the Hoffmann et al. (in press) study and are similar to other school-based interventions that were successful in increasing sun protection and skin cancer knowledge (Buller et al., 1994; Fork et al., 1992; Goldstein & Lesher, 1991; Loescher et al., 1995; Mermelstein & Riesenberg, 1992; Ramstack et al., 1986).

Attitudes and Beliefs

The School-Plus-Home intervention was effective in increasing positive attitudes and beliefs over the Control group. Children in the School group did not exhibit more positive attitudes and beliefs than children in the Control group, which was also not supported in the Hoffmann et al. (in press) study, suggesting replication. However, as with the Hoffmann et al. (in press) study, children's total attitudes and beliefs were

relatively healthy at pre-intervention, thus creating a ceiling effect and making significant changes improbable.

The attitudes and beliefs construct of Barriers was most resistant to change and, in fact, for the School and Control groups, children perceived more barriers following the intervention. The construct most impacted (albeit, minimally), in the positive direction, by the interventions was benefits of engaging in sun exposure behaviors. This construct was assessed by questions such as "Laying out in the sun is healthy for me" and "People who have a suntan are more healthy." This finding is similar to a study by Buller et al. (1994), who also found less favorable attitudes toward sun exposure in 4th, 5th, and 6th graders following an intervention. The other attitudes and beliefs constructs were not impacted by the interventions, which may also be due to the ceiling effect and/or the poor psychometric properties of the measures of these narrow-band constructs.

The maintenance of attitude and belief change for the School-Plus-Home group was not obtained and, in fact, for this group, was almost reduced to pre-intervention levels. This may be due to the fact that attitudes and beliefs are more resistant to change and although the change was maintained for two weeks, the intervention was not successful in long-term maintenance of attitude and belief change. At best, children who received an intervention did not evidence a decrease in their positive attitudes and beliefs as much as the Control group did.

Twenty percent of children in the School group evidenced a decline in positive attitudes and beliefs, indicating that the intervention was detrimental in some way to one-fifth of the children in this group. This finding may be due to the attempt to change the children's attitudes and beliefs without a parallel attempt to change their parents' attitudes

and beliefs. These findings have also been obtained in other health areas such as nutrition (Perry et al., 1987; Perry et al., 1988) and bicycle helmet use (Pendergrast et al., 1992). The authors argue, and their findings support, that it is critical to attempt to change familial patterns of thought and behavior in order to change an individual child's thoughts and behaviors. Ten percent of children in the Control group improved significantly at the 2-week post-intervention period, which may have been due to demand characteristics of the testing.

Overall, hypotheses regarding attitudes and beliefs were not supported. The findings for this study regarding attitudes and beliefs are consistent with previous studies which also showed no significant attitude and belief change following interventions (Cameron & McGuire, 1990; Goldstein & Lesher, 1991; Ramstack et al., 1986).

Intentions

Children in the School-Plus-Home group did increase in intentions over time and endorsed more intentions than the other two groups following the intervention period. Furthermore, children in the School group did exhibit more intentions than the Control group at the post-test period, which demonstrated replication of the Hoffmann et al. (in press) study. At best, results show that receiving an intervention prevents a decline in intentions. This study was an improvement over previous findings (Mermelstien & Riesenberg, 1992) in which no change in intention was found. Possible reasons for these differences in findings could be intervention differences (i.e., multimodal vs. unidimensional) and differences in defining intentions (i.e., one behavior vs. several behaviors).

As will be demonstrated in the next section, intentions do not always translate to behavior. Buller and Buller (1991) suggest several possible reasons for this. These include: the behavior is not prompted (i.e., no cues to action), there is a barrier that inhibits performance (i.e., sunscreen is not available), or there is a skill deficit (i.e., the child is unable to apply sunscreen or dress himself appropriately). These factors might be important to examine in future studies. For example, if children report that they did not use sunscreen, ask them the reason for this. Was it because they forgot, or they did not have sunscreen, or does their parent not allow them unlimited access to sunscreen?

Behaviors

It has long been demonstrated that increases in knowledge do not necessarily presume increases in behavior. This study provides more evidence for this statement given that the hypotheses put forth for behavior were not supported statistically. The child self-report measure of behavior revealed that the groups did not improve over time nor were they significantly different at any time point on total protective behaviors. However, the interventions were successful in increasing sunscreen use over the Control group. This is consistent with the Hoffmann et al. (in press) study which demonstrated a 100% increase in sunscreen use post-intervention. However, the method for measuring self-reported sunscreen use was different in each of these studies. Hoffmann et al. (in press) used a visual analogue scale which was found to have marginal psychometric properties.

Clinical change estimates indicated that 47 percent of children in the School-Plus-Home group evidenced a clinically significant increase in self-reported protective behaviors following the intervention, compared to 38 percent in the School group and 11

percent in the Control group. However, the overall levels of protection continued to be very low with only 21-30 percent of time engaged in outdoor activities being protected time. These findings are similar to studies by Cockburn et al. (1989) who found that only 30 percent of subjects used adequate protection measures and Grob et al. (1993) who also found a low level of adequate sun protection (38%) among subjects. However, some researchers reported that, although they were unable to increase sunscreen use through an intervention, they were able to decrease overall sun exposure (Buller et al., 1996). This is an excellent distinction and should be used in further studies to determine the effectiveness of interventions.

Evaluation of the recall interview demonstrated that children in the School-Plus-Home group tended to report a higher percentage of protective behaviors than the parents reported for these children. This may have been because of the demand characteristics associated with the children in that group. The likelihood is that the children in this group knew that an improvement in behaviors is what was desired as an outcome from the intervention. The children in the Control group may have been more likely to be honest about their protective behaviors because they were not induced to behavior change by an intervention. Interestingly, however, the children in the School-Plus-Home group were consistent in their reporting of behaviors in that the correlation between this recall interview and their report of protective behaviors at the post-test was very high (there was no more than a 10 day lapse between the recall interview and the post-test measure). The correlation for the recall interview and the post-test behavior measure was high for the sample as a whole as well, indicating that the children were fairly consistent in reporting their sun protective behaviors.

Using child report on the recall interview, groups differed on shade protection, sunscreen use, and overall protection. For shade protection, children in the School group differed from children in the School-Plus-Home and Control groups, with the school group engaging in less shade protection. For sunscreen protection, children in the School-Plus-Home engaged in more sunscreen use than children in the Control group. These findings for sunscreen use were consistent with the sunscreen use findings on the MOAS, providing more support for the contention that the School-Plus-Home intervention is effective in increasing sunscreen use. The School-Plus-Home group and Control group also differed on total protection, which is not consistent with the MOAS findings for overall protection. However, given the information above regarding correlation between parent and child report, these results should be interpreted with caution because the scores for the School-Plus-Home group are likely to be inflated. Consequently, when parent recall was used, no significant differences were found among groups on parent report of child's protective behavior in the past 24 hours. Nevertheless, Mayer, Sallis, Eckhardt, Creech, Johnston, Elder, & Lui (1997) found that when a colorimeter (a device used to measure skin erythema) was used as the "gold standard", parents were accurate in reporting whether the child was outdoors but not in reporting how much protection the child used. This may have been the case in the current study but was not measurable.

Children in the School-Plus-Home intervention took and returned more packets of sunscreen than children in the other groups. Furthermore, children in the School group took and returned more packets than the children in the Control group. This finding was also obtained in the Hoffmann et al. (in press) study. Unfortunately, despite the fact that

children took the packets of sunscreen, it is not known exactly what the children may have done with the sunscreen. Qualitatively, however, the teachers indicated that the children in both of the intervention groups asked more about using sunscreen during their PE and recess breaks following the intervention than they had prior to any health promotion efforts.

One factor related to the interventions in this study that may have affected outcome is that the intervention emphasized health risks. Conversely, Jones and Leary (1994) found that stressing negative effects of the sun on appearance rather than emphasizing health risks was more conducive to behavior change. Another factor may be the current controversy surrounding the effectiveness of sunscreens, particularly the notion that sunscreens can be harmful. When there is ambivalence regarding most issues, the likelihood is that people will do what takes the least amount of time, costs the least, and expends the least amount of energy. Unfortunately, the consequence may be that people will turn away from using sunscreens.

School-Plus-Home Intervention

The School-Plus-Home intervention appears to have many advantages over the School intervention. The evidence provided herein suggests that, although the School intervention is effective in increasing skin cancer and sun protection knowledge, intentions to engage in sun protective behaviors, and self-reported sunscreen use, the School-Plus-Home intervention is even more effective.

Participation rates, subsequent to randomization, were very high in the School-Plus-Home group. Eighty-five percent of the children in this group completed the homework assignments with at least one family member. However, the disappointing

aspect of this is that the children who did not complete the homework (15%) did not differ significantly from those who did on any of the post-test or follow-up measures. This means that the addition of the family component is unable to differentiate those who changed on post-test measures from those who did not. Furthermore, each child and parent dyad may vary on the amount of time and effort dedicated to the intervention components. The number of family members completing the tasks might also have been a factor. Providing incentives for parental involvement and assuring parent-child communication would be beneficial in future studies.

As a group, however, children in the School-Plus-Home intervention benefited more from that intervention than the children in the School group benefited from their intervention. The difficulty lies in determining whether the effort to include parents is worth the extra knowledge and intentions these children exhibited, particularly given that these variables did not lead to significant behavior change. Examining changes in parent knowledge, attitudes and beliefs, intentions, and behaviors would be beneficial in future studies to determine the parents' contribution to change in their children in conjunction with the intervention itself. This is particularly important because some researchers report that parents will make changes in their own health behavior or attitudes when interventions are aimed not at them, but at their children in a school setting (Perry et al., 1987). Furthermore, given the premises of Social Learning Theory, it would be important in future studies to ask parents whether they use sunscreens themselves. Several researchers have found this to be a significant predictor of child sunscreen use (Grob et al., 1993; Robinson & Rademaker, 1998).

The intervention developed and tested in this study had several characteristics of an effective intervention. The intervention: included messages that stressed the social consequences of prevention, emphasized the positive effects of preventive behaviors, had children become actively involved in the intervention, described how to perform preventive behaviors, described the consequences and benefits of engaging in protective behaviors, emphasized perceived vulnerability, made concrete recommendations, provided cues to action, and encouraged parents to exert more influence in this area and to model appropriate behavior. Furthermore, it was multimodal, lasted longer than one class period, included the practice of targeted healthy behaviors, and attempted to alter social norms (Hoffmann et al., in press).

The results obtained in this study are consistent with a previous study conducted by Hoffmann et al. (in press) who found that, compared to a no intervention control group, students in an intervention group increased knowledge, intentions, and self-reported sunscreen use following a two-week post-intervention period. Similarly, Rodrigue (1996) found that mothers who received an intervention showed significant increases in skin cancer knowledge, attitudes, and behaviors at a 3-month follow-up and these effects were maintained over time. However, as has been demonstrated, the current study did not replicate the effects for increased attitudes and beliefs and overall behaviors. The results are also consistent with Boutwell (1995) who found high levels of knowledge but low levels of self-reported sun protective behaviors in a community based intervention study. Mermelstein and Reisenberg (1992) found similar results in that they were able to increase knowledge and perceived susceptibility. However, they were unable to increase the students' intentions through their intervention.

Conceptual Model

Regression analyses revealed that for pre-intervention intentions, child gender (female), more positive pre-intervention attitudes and beliefs, and higher pre-intervention self-reported sunscreen and shade use were significant predictors. The finding that female gender was associated with intentions is similar to findings that have been obtained in other studies that demonstrated that practicing protective behaviors was associated with being female (Banks et al., 1997; Hall, Lew, Koch, & Nader, 1997). The hypothesis that pre-intervention attitudes and beliefs and self-reported protective behaviors would contribute to pre-intervention intentions was supported.

The hypothesis that pre-intervention intentions would account for a significant proportion of the variance in post-intervention intentions was supported and is consistent with prior studies that showed that pre-intentions accounted for 29 percent of the variance in post-intentions for an intervention group (Hoffmann et al., in press). Furthermore, previous studies found that attitudes and beliefs accounted for 8% of the variance in post-intervention intentions (Hoffmann et al., in press). The current study found that 7% of the variance is accounted for by attitudes and beliefs. Furthermore, 7% of the variance was accounted for by having received the School-Plus-Home intervention (modified by a pre-intervention intentions x group interaction). This is consistent with the finding from the ANCOVA which also found a Group effect for post-intervention intentions.

Being female was also predictive of post-intervention sunscreen use, suggesting that the intervention may have affected boys and girls differently with regard to sunscreen use. As predicted, post-intervention intentions was predictive of post-intervention sunscreen use. This is consistent with the Hoffmann et al. (In press) study

which found that intentions accounted for 10% of the variance in sunscreen use. However, post-intervention intentions were not predictive of the other sun protective behaviors. Given that the ANCOVA for differences among groups for sunscreen use was significant, it is surprising that intervention status was not predictive of post-intervention sunscreen use. However, when the p-value (.046) is examined, this finding is more acceptable. Not surprisingly, the most significant predictors of the four post-intervention behaviors were pre-intervention behaviors.

Younger parent age was found to be significantly predictive of long-sleeve shirt use. There is no previous literature to support this and there does not appear to be any particular explanation for this finding. Not surprisingly, being a boy was predictive of hat use. This suggests that reinforcing hat use as an acceptable protective clothing method for girls would be important in future studies. Receiving the School intervention was also predictive of hat use. Given that the School-Plus-Home intervention did not did from the School intervention with regard to reinforcement of hat use behaviors, the explanation for this finding is not apparent.

In summary, the models for prediction of intentions and behaviors were somewhat consistent with hypotheses and previous literature. Interestingly, girls were found to be more likely to endorse positive intentions prior to the interventions. While this effect dissipated at the post-intervention period for overall protective behaviors, the effect remained for post-intervention sunscreen use. It is possible that the gender of the health promotion messenger may have impacted this gender effect and this should be examined in future studies. This finding is supported by Buller and Buller (1991) who stated that similarity fosters competence and can increase trust, thus providing for increased efforts

to comply. The self-report of pre-intervention behaviors is important to both pre-intervention intentions and post-intervention behaviors. Unfortunately, the levels of pre-intervention protective behaviors were fairly low at the outset. Changing and increasing positive attitudes and beliefs appear to be paramount to increasing intentions. Unfortunately, the main predictors of post-intervention behaviors were pre-intervention behaviors. This is consistent with the notion that 'nothing predicts future behavior better than past behavior.'

As anticipated, knowledge did not contribute to either intentions or behaviors. This is consistent with the Health Belief Model and self-efficacy theory in that these models suggest that knowledge of effective risk reduction strategies does not necessarily lead to behavior change. The relationship between skin cancer knowledge and sun protective behaviors has been reported inconsistently in the literature with some indicating a positive relationship (For example, Banks et al., 1992; Keesling & Friedman, 1987) and others indicating no relationship (Hoffmann et al., in press; Lescano & Rodrigue, 1997; Maducdoc et al., 1992).

Strengths and Limitations

A major limitation of the previous literature on skin cancer interventions is the lack of a control group. This study is an improvement in this respect in that there were two treatment groups as well as a control group. Furthermore, one of these intervention groups received an already validated intervention (allowing for replication) while the other received a rationally derived intervention with the addition of evaluation of the family component. This is also important given the dearth of intervention studies in this area that include a family component, despite the fact that several other health promotion

areas (e.g., seat belt use, bicycle helmet use) have effectively included family components. This study also uses several indices of change (self-report of sunscreen use, sun protection recall interview, and a permanent products index) that allow for a better understanding of the impact of the intervention. A weakness of previous literature has been an emphasis on sunscreen use as a preventive behavior when there are other behaviors that are also important with respect to skin cancer prevention. This study examines the four behaviors recommended by the American Cancer Society (shade, sunscreen, hat, long-sleeve shirt use) to further delineate protective behaviors.

This study is not without its limitations, however. The psychometric properties of the outcome measures were found to be adequate, but not excellent, in previous studies. However, the psychometric properties for this particular sample were good, with the exception of the constructs within the attitudes and beliefs measure, which were significantly inadequate. More items should be added to this measure to attempt to improve the internal consistency reliability. A second limitation is the reliance on self-report. This, however, is always of concern in a psychological study and was minimized by having three outcome measures for behavior. There are physiological measures available to assess extent of UV damage to the skin. However, the cost of these instruments are too great to use feasibly within the school setting (Kopf, Salopek, Slade, Marghoob, & Bart, 1995).

Another constraint is the lack of knowledge concerning the various aspects that have been chosen as components of the School-Plus-Home intervention. While these have been found to be effective in other areas of health promotion, they have essentially gone unexamined in the skin cancer intervention literature. Breaking down these

intervention components and examining how each of them influences the dependent variables would be an important task in the future. Another limitation may be the generalizability of the study given that the sample is from rural North Florida and may not be typical of other parts of the country or even other areas of Florida.

Implications

As we near the deadline for Healthy People 2000 (USDHHS, 1990), it becomes increasingly important to strive for the goal of increasing to 60 percent the proportion of people engaging in sun protection behaviors and decreasing maladaptive sun exposure behaviors. This study demonstrated that at this time we are nowhere near achieving this objective. The interventions were effective, however, at increasing children's sun protective knowledge, intentions, and self-reported sunscreen use (which, despite some improvement, continued to be at abysmal levels). These improvements are important and necessary, but not sufficient, to the greater task of preventing skin cancer. In addition, this study will add to the relatively non-existent literature on family components of skin cancer prevention interventions. The feasibility of incorporating this intervention as a regular health promotion effort in the schools is also monumentally important. Implementation of this intervention in the schools was very manageable once permission was given by the school boards, principals, and teachers to incorporate this project into their Science classes. Although the current study is feasible, the School-Plus-Home intervention findings do not support increased efforts to include family members in this manner. Perhaps a combination of the School intervention (as developed by Hoffmann et al. (in press) and replicated here) and an effective parent intervention such as the Rodrigue (1996) intervention, might be most effective in bridging the gap between

parents and children and sun protection intervention efforts. A long range goal and implication would be to emphasize to the schools the importance of providing means by which students can protect themselves from the sun (i.e., provide sunscreen, recess in the shade), thereby decreasing the students' risk for skin cancer.

APPENDIX

Demographic Questionnaire

Knowledge Scale

Attitudes and Beliefs Scale

Intentions Scale

My Outdoor Activity Sheet (MOAS)

Sun Protection Recall Interview (SPRI)

Demographic Questionnaire

Child Name _____ Your name _____ Relationship to child _____

Child Race _____ Child Gender _____ Child Age _____

Your Age _____ Your Occupation _____ Spouse's Occupation _____

Highest Grade Completed: 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Spouse's Highest Grade Completed: 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

List who lives in your home	Age	Relation to your child
_____	___	_____
_____	___	_____
_____	___	_____
_____	___	_____
_____	___	_____

Number of beach visits in past year ___ Average length of stay at the beach (hours) ___

Do you know of any family members who have/had skin cancer? Yes No
If yes, relationship to you: _____

How many painful (e.g. blistering, etc.) sunburns (lifetime) has your child had? ____
How many painful (e.g. blistering, etc.) sunburns (lifetime) have you had? _____

At what age do/would you give your child responsibility for protecting themselves from the sun?
_____

I think a suntan enhances my child's appearance. True False

Has your child's pediatrician given you information concerning skin cancer or sun protection in the last 12 months? Yes No If yes, in what form? _____

Do you have sunscreen at home? Yes No

Which of the following best describes your/your child's reaction to your/your child's first exposure to summer sun for one hour at midday?	Child	Parent
A painful burn the next day and no tan one week later	_____	_____
A painful burn the next day and a light tan one week later	_____	_____
A slightly tender burn the next day and a moderate tan one week later	_____	_____
No burn the next day and a good tan one week later	_____	_____

Phone Number _____
What would be the best time of the day to reach you at home? _____

CIRCLE THE LETTER IN FRONT OF THE CORRECT ANSWER
There is only one correct answer.

1. To get burned by the sun, it may take only:

   a. 12 minutes
   b. one hour
   c. two an a half hours
   d. half a day
   e. don't know

2. Which skin damage is NOT caused by the sun:

   a. wrinkles
   b. heat rash
   c. peeling
   d. pimples
   e. don't know

3. The riskiest time to be in the sun is:

   a. 7 am to 9 am
   b. 10 am to 3 pm
   c. 4 pm to 6 pm
   d. at dawn
   e. don't know

4. Sunscreens should be put on:

   a. only face, nose and lips
   b. only back, arms and legs
   c. any part of the body that is not protected by clothing
   d. the side of your body facing the sun
   e. don't know

5. Sunscreens need to be put on:

   a. 30 minutes before going into the sun
   b. when the skin is dry
   c. after swimming
   d. all of the above
   e. don't know

6. Sunscreens should have a sunblock of:

   a. 3
   b. 5
   c. 10
   d. 15
   e. don't know

7. The time of year when you can't get a sunburn is:

   a. winter
   b. spring
   c. summer
   d. you can get a sunburn during any time of the year
   e. don't know

WHICH IS TRUE?... WHICH IS FALSE?

8.	If you have a tan, your skin can still be damaged by the sun.	T	F	DK
9.	Sunburn is as dangerous as any other burn.	T	F	DK
10.	You can get a sunburn if it is cold outside.	T	F	DK
11.	The sun cannot hurt the naturally dark skins.	T	F	DK
12.	You should re-apply your sunscreen about every 2 hours when in the sun.	T	F	DK
13.	Sitting under a beach umbrella protects you completely from the sun.	T	F	DK
14.	Using a tanning booth or salon is a safe way to get a tan.	T	F	DK
15.	You can get a sunburn on a cloudy day.	T	F	DK
16.	If you have red or blonde hair, you are more likely to get sunburned.	T	F	DK
17.	You don't have to wear a sunscreen if you are under 10 years old.	T	F	DK

HOW MUCH DO YOU AGREE OR DISAGREE?...THERE ARE NO RIGHT OR WRONG ANSWERS.
CIRCLE THE NUMBER THAT DESCRIBES HOW YOU FEEL.

1 = STRONGLY AGREE
2 = AGREE
3 = NOT SURE
4 = DISAGREE
5 = STRONGLY DISAGREE

		Strongly Agree				Strongly Disagree
1.	Laying out in the sun is healthy for me.	1	2	3	4	5
2.	My teachers think that wearing sunscreen is a good thing.	1	2	3	4	5
3.	It is too much trouble to put on sunscreen.	1	2	3	4	5
4.	Wearing sunscreen is important to me.	1	2	3	4	5
5.	People who have a suntan are more healthy.	1	2	3	4	5
6.	Wearing sunscreen will keep you from getting a sunburn.	1	2	3	4	5
7.	My parents think that having a suntan is a good thing.	1	2	3	4	5
8.	I am able to put on sunscreen to protect my skin from the sun.	1	2	3	4	5
9.	Most of my friends think that having a suntan is a good thing.	1	2	3	4	5
10.	Skin cancer is a dangerous disease.	1	2	3	4	5
11.	Based on my past behavior in the sun, I think there is a chance I will get skin cancer.	1	2	3	4	5
12.	Sunburns are bad for your skin.	1	2	3	4	5
13.	My parents think that wearing sunscreen is a good thing.	1	2	3	4	5

		Strongly Agree				Strongly Disagree
14.	I do NOT know how to use sunscreen correctly.	1	2	3	4	5
15.	My friends think that wearing sunscreen is a good thing.	1	2	3	4	5
16.	I can protect myself from the sun.	1	2	3	4	5
17.	People my age cannot get skin cancer when they are older.	1	2	3	4	5
18.	It is hard for me to remember to put sunscreen on.	1	2	3	4	5
19.	If I wear sunscreen, I will be less likely to get skin cancer.	1	2	3	4	5
20.	It is hard for me to put sunscreen on because we do not have any at my house.	1	2	3	4	5
	**********					
21.	Next time, I intend to put sunscreen on when I am at the pool or beach.	1	2	3	4	5
22.	Next time, I intend to put sunscreen on when I am playing outside (like riding my bike or playing sports).	1	2	3	4	5
23.	Next time, I intend to put sunscreen on all parts of my body not covered by my clothes when I am playing outside.	1	2	3	4	5
24.	Next time, I intend to put sunscreen on again when I get out of the water at the pool or beach.	1	2	3	4	5
25.	Next time, I intend to put sunscreen on 15 minutes before going outside so the sunscreen can soak into my skin.	1	2	3	4	5
26.	Next time, I intend to put sunscreen on so I don't get a sunburn.	1	2	3	4	5

MY OUTDOOR ACTIVITY SHEET

List the things you did outside in the past week:	Did you wear sunscreen?		hat?		long-sleeve shirt?		Were you in the shade?	
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No
_____	Yes	No	Yes	No	Yes	No	Yes	No

SUN PROTECTION RECALL INTERVIEW

Subject # ____ Date: _____ Weekend Weekday Time of Call: _____
Weather(official): Hi Temp: _____ Description: _____

Outdoor Activities During Previous Day:	Was parent present?	Time Engaged in Activity (clock time)	Sunscreen	Hat	Shirt	Shade
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK

If sunscreen was used, what SPF was it? _____

Person spoken to: _____ Relationship to subject: _____Time of Call: _____

Outdoor Activities During Previous Day:	Was parent present?	Time Engaged in Activity (clock time)	Sunscreen	Hat	Shirt	Shade
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK
_____	M F N	____-____	Y N DK	Y N DK	Y N DK	Y N DK

If sunscreen was used, what SPF was it? _____

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BIOGRAPHICAL SKETCH

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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